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A SYSTEM

OF

MIDWIFERY,

INCLUDING THE

DISEASES OF PREGNANCY AND THE PUERPERAL STATE.

BY

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OBSTETRICAL AND GYNÆCOLOGICAL SOCIETY
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PREFACE.

The Author's object in this work has been to furnish to Students and Practitioners a Complete System of the Midwifery of the present day. Its claim to a title so ambitious may be questioned.

Of English Text-Books, some of the very best have long been out of print; some are out of date; and others are mere Handbooks, in which the subject is, however ably, but cursorily treated. In our language, scarcely a modern work exists which can be compared with those of Cazeaux and Scanzoni. This is the Author's apology for an attempt in which, while he does not presume to emulate those authors, he ventures to hope that the fruit of some earnest labor, but too scant leisure, may not be held unworthy of consideration.

There are, he believes, few modern works of approved merit, whether British or Foreign, with which the Author has not made himself familiar; nor has he scrupled to avail himself from these sources, of what seemed to him, at any point, to contribute to the elucidation of the subject. In no case, it is hoped, has this been done without ample acknowledgment.

The meagreness of statistical details, references, and illustrative cases, is a part of the original plan, adopted with the view, as far as the subject will admit, of maintaining the narrative form.

To several of his colleagues, to many professional friends, and, especially, to Dr. Gavin P. Tennent for assistance in passing the work through the press, the Author is under obligations which he cannot too warmly acknowledge.

4 Montague Place, Glasgow,
July 1st, 1873.

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A SYSTEM OF MIDWIFERY.

CHAPTER I.

INTRODUCTORY.

HISTORY OF MIDWIFERY—HIPPOCRATIC ERA—ARABIAN SCHOOL—AMBROISE PARÉ—MAURICEAU—ENGLISH MIDWIFERY—OBJECTIONS TO THE PRACTICE OF MIDWIFERY CONSIDERED—COMPARATIVE ANATOMY OF THE PELVIS—THE PELVIS AS A TUBE THROUGH WHICH THE PRODUCT OF CONCEPTION PASSES—PARTURITION IN THE PRIMATES: IN THE VARIOUS RACES—THE ERECT POSTURE THE MAIN CAUSE OF COMPARATIVE DIFFICULTY IN THE HUMAN SPECIES—THE HUMAN PELVIS A CURVED CANAL—SEPARATION OF PELVIC ARTICULATIONS DURING LABOR—MIDWIFERY DEFINED.

THE History of Midwifery is to the student of that art a subject not only interesting, but also in some degree instructive. To trace from their earliest development, whether in the crude ideas of ancient times, or in the hasty generalizations of an epoch not far distant from our own, the growth and maturity of the theories which we now believe to be in accordance with the truth, is indeed in itself an attractive pursuit; and the student has his reward in the thorough mastery which he thus obtains over details, which can scarcely be effected by the mere dogmatism of ordinary teaching.

For various and evident reasons, however, the history of the obstetric art cannot be embraced fittingly within the limits which must be fixed for matter purely introductory to the study of a great practical subject. Not even in outline, then, will a consecutive history of Midwifery be attempted; but, as reference will in the sequel be not unfrequently made to the doctrines and practice of the past, a few sentences may here be devoted to the consideration of the midwifery of certain epochs, in view of the influence which these may be supposed to exercise on the practice of the present day.

From the earliest records, more or less authentic, which seem to throw light upon the subject, it would appear that the practice of Midwifery was in the first ages entirely in the hands of women. If we may judge, however, from the fact that a law was passed in Athens, at a very early period, by which women were absolutely prohibited from practicing physic in any of its branches, we are entitled to assume that the art had not in the main prospered in their hands. It is in the Hippocratic writings that we find the first trace of a profound intellect and a truly scientific mind being applied to the observation of the phenomena of parturition. The works, indeed, on this subject, which are attributed to Hippocrates, are, for the most part, passed over as unauthentic by modern critics; but there can at least be no doubt that they were written before Aristotle, at the latest, we may assume, about 400 B.C. The head, according to this authority, is the only natural presentation; and when the child either lies across or presents with the feet, the woman cannot be delivered. Observe the effect of this aphorism. The head being thus assumed to be the only presentation in which the natural forces could effect delivery, it follows as the natural corollary of this proposition, that one of the chief aims of operative midwifery must be to convert breech and footling, as well as transverse presentations, into presentations of the head. The contemplation of such a state of practice is too horrible to dwell upon. His graphic illustration of the olive in the neck of the oil jar is familiar to all, and demonstrates to perfection that it can, in its long diameter, be easily passed through; but he adds, if the long diameter of this oval body be thrown across, either the bottle will break or the olive will be crushed. It is strange, indeed almost incredible, that having recognized the form of the fœtus while in the womb, as his simile clearly shows, he should have failed to perceive that an oval body, be it olive or fœtus, may pass by either end of its long diameter. Overlooking this fact, he established a rule of practice which obtained in after ages, as there is every reason to believe, for a period little short of 2000 years, at what expense of maternal and fœtal life it is impossible to compute. From this early period we must also date the operation of Craniotomy, for the performance of which quite intelligible rules are given.

This error of Hippocrates was corrected by Celsus in the first century of the Christian era, and even, to some extent, at a much earlier date by Aristotle; but it is to the former that the credit in this matter is usually ascribed by the commentators, as his words are clear and free from ambiguity. This is manifest from the following sentence alone, extracted from the instructions given by him for the management of transverse cases: "Medici vero propositum est, ut eum manu dirigat, vel in caput, *vel etiam in pedes*, si forte aliter compositus est."

Some four or five hundred years later, a careful compilation of all that had been written up to that time on the subject of midwifery was made by Ætius. Among the untoward circumstances which he details as causes of difficult labor, he mentions a narrow pelvis, the presence of polypi, and obliquity in the position of the womb. He states further, that an anchylosis of the *ossa pubis* at their point of junction is a fertile cause of difficult labor, by preventing the separation which would otherwise, he supposes, occur; and that distension of the rectum or bladder may constitute a mechanical impediment to delivery. He observes also, that difficult labor is due as well to a faulty condition of the child as to the maternal parts. If the child, or any of its parts, were unduly large, labor was presumed to be impeded by the fact that the motions and leaping of the child (supposed, even in comparatively modern times, to contribute greatly to its delivery) was thereby interfered with. Many other points of interest and of practical importance are referred to by him, one or two of which may be noticed. We have here, for example, in a chapter, "De Fœtûs Extractione ac Exsectione," which he takes from Philumenus, the first indication of the speculum vaginæ, in an instrument which he recommends for the purpose of separating the external parts, in order to bring the cause of obstruction into view. We have also a perfect description of the crotchet (*uncinus attractorius*); and in his description of a method of delivery by the application of two crotchets,—one to each side of the head,—we cannot fail to observe that the mechanical principle of the midwifery forceps was not only then adopted in practice, but was thoroughly understood by the author, and brought him very near to the discovery of the forceps of modern times. And finally, we have here the operation of turning in cases of difficult cranial presentation recommended, in terms which place it beyond a doubt that the procedure indicated is in all respects identical with what of late years has been introduced in similar cases, as a novelty and an improvement in modern practice. The credit of the discovery and demonstration of the Fallopian tubes was claimed by Galen, but there is no doubt that they were described at a still earlier period than the epoch now in question by Rufus Ephesus, who lived in the reign of Trajan (*circa* A.D. 110). The last writer on this subject of the old Greek school was Paulus Æginetà, to whose works little originality can be attributed.

The favor in which literature and the sciences were held by the Arabs evidently exercised a most beneficial influence in the development of the Arabian school of midwifery. The name of Rhazes, a physician of Bagdad towards the end of the ninth century, is associated with the discovery of the fillet. About a hundred years later a very remarkable and voluminous series of works on midwifery and allied subjects was given to the world by Avicenna, a physician of Ispahan. His works consist for the most part in a confirmation of the leading views of the Greek school, and as they enjoyed an extraordinary popularity in Europe, as well as in Asia, it was by this channel mainly that the errors of the ancients were diffused throughout the world. The fundamental error of Hippocrates he adopts in a modified degree. All presentations, says he, save the head, are preternatural: the head ought, therefore, to be reduced, in all such cases, into the natural position, but, should this be impracticable, we may deliver by the feet. He recommends in certain cases the use of the fillet, which when used for extraction, is to be fixed over the head; and, should this fail, *the forceps* is to be applied to the head and extraction then attempted, while as a last resource only are the perforator and crotchet to be employed.[1] A reference to this passage makes it perfectly clear that the instrument alluded to is essentially the midwifery forceps; while the fact that the author nowhere describes the instrument as a novelty, warrants us in the belief, that about the tenth century, or possibly at an earlier period, the use of this important instrument was familiar to the Arabian physicians. In the works of a later writer, of the eleventh or twelfth century,[1] the forceps then used in midwifery is described and delineated. It is represented under two different forms, the *misdach* and the *almisdach*. In the Arab original in the Bodleian Library at Oxford, to which Smellie refers in his learned introduction, the former of these is described as straight and the latter as curved, but in the Latin version both are described as circular and full of teeth.

---

[1] See the chapter, "De regimene ejus, cujus partus fit difficilis causâ magnitudinis fœtûs."

From this period, until the discovery of the art of printing in the middle of the fifteenth century diffused a knowledge of the writings of the ancients throughout the civilized world, our art seems to have made but little progress. Indeed, we may even say with truth, that after the decline of learning in the East, the art of midwifery, as practiced in Europe, was far inferior to what obtained among the Arabians and even among the later Grecian writers. This we may easily understand if we reflect that Hippocrates was the text-book in the hands of all, and that his errors continued to influence the practice of midwifery until the dawn of science, after the dark ages of our art, dissipated in some measure the mists of ignorance and superstition.

In 1518, Dr. Linacre, physician to Henry VIII, obtained through his interest with Cardinal Wolsey, letters-patent constituting a corporate body of regular physicians in London. This foundation of the Royal College of Physicians of England marks the period at which midwifery, for the first time in this country, approached the dignity of a science. It must be confessed, however, that the earliest efforts of English authors contributed but little to the advancement of the art, as founded upon true scientific principles. The first English work on the subject was a translation of Eucharius Rodian, by Dr. Raynalde, under the title of "The Byrthe of Mankynde."[2] That this work was held in no little repute on the Continent, is evident from the fact that it had been translated from the original High Dutch, not only into Latin but also into Dutch, French, Spanish, and other languages. And yet, when we examine it critically, we find that, except as a literary curiosity, it scarcely merits our attention. Not only does he indorse the famous blunder of Hippocrates, by saying that we should turn the child to the natural position even when the feet present, but he boldly promulgates another error when he says that when the child presents in the natural way by the head, the face and foreparts of the fœtus are towards the foreparts of the mother. In most other respects his views are but copies from the ancient writers. The same remark may be made with reference to the productions of his contemporaries, as we find doctrines which are essentially the same promulgated in the collections of monographs, memoirs, and reproductions from ancient and modern sources, known as the "Gynæciorum Commentaria," a collection familiar to all who have studied this subject with care. A very superficial study of this compilation will suffice to show that even the more flagrant errors of the ancients were still systematically taught; and therefore are we bound to conclude that the Hippocratic aphorism of turning by the head in breech presentation had, up to this period, been all but universally adopted in European practice, even although that error had been to a great extent corrected by the later Greek and the Arabian writers. It is not, then, too much to assert, as we have done, that the blunder of Hippocrates, so frequently alluded to, was the practice for little less than 2000 years after his death.

---

[1] Albucasis or Alsaharavius.

[2] London, 1565.

In this collection, however, there is one work which we must mention with more respect,—that of the illustrious Ambroise Paré,—of whom Smellie says no more than is his due when he terms him "the famous restorer and improver of Midwifery." The revival of anatomical study under Vesalius, and the numerous dissections which had been made of pregnant women by him and by his follower Columbus, had already corrected many of the anatomical and physiological errors, which, being time-honored, were therefore considered to be respectable, and were generally admitted to be true. The belief in these doctrines being thus sapped by the logic of facts, the whole rotten superstructure began to crumble away, and from this epoch modern midwifery may be said to have had its origin. It required a mind of no ordinary power and energy to be the pioneer in this new path ; but it requires no critical analysis of the works of Paré to show that the great surgeon was a great master, and that scientific Midwifery as well as Surgery had at last found a fitting modern exponent. Paré advises turning by the feet in difficult cranial presentations ; but if this cannot be done, he recommends craniotomy, or delivering by the crotchet,—which instrument he directs us to fix, by the method of Ætius, in the orbit, mouth, or below the chin. He frankly confesses, that although he has carefully studied the position of the fœtus in utero, he has been unable to come to a satisfactory conclusion as to what is to be considered the normal position; while, as regards the causes of difficult labor, he dilates at some length, and on the whole with considerable accuracy. After pointing out with great clearness the serious nature of the impediment caused by cicatrices, the result of former midwifery accidents, he enumerates the various positions of the fœtus which interfere with or prevent delivery, and concludes by noting the bad effects of a premature escape of the waters, and of failure of the pains.

At this period, the Parisian school was undoubtedly the first in the world ; and as all the leading surgeons there practiced midwifery, the practice as well as the theory of obstetrics became rapidly developed. Guillemeau, surgeon to the French king, and a pupil of Ambroise Paré, further developed the theories of his master ; but the book which seems to have exercised the greatest influence was the remarkable one of Mauriceau, "Sur les Maladies des Femmes grosses, et de ceux qui sont accouchées." This author gives by far the best account which, up to his day, had appeared of the phenomena of labor as observed by the accoucheur. He criticizes with some asperity the views of Columbus, which, however, we find to be, at least as regards the position of the child in the womb, infinitely more correct than his own. The following are his conclusions on this point: Up to the seventh or eighth month, the child is situated in the centre of the womb, the head being towards the fundus and the face looking directly forwards. About this period an important change takes place in its position, which, if it happens sooner, is attended with danger. The weight of the head and upper part of the infant having now become relatively greater, it causes the child to turn forwards (*faire la culbute en devant*), so that the face is now turned directly backwards to the promontory of the sacrum. This doctrine is simply an amplification of the views of Hippocrates on this point; and it must be admitted, even in the present day, that the greater relative frequency of breech and irregular presentations in cases of premature delivery, lends some apparent confirmation to the idea. He repudiates the view formerly entertained, that the child, by its own instinctive or automatic movements, aided in any way in effecting its expulsion, and recognized not only the contractility of the uterine tissue, but also the supplementary expulsive force which is derived from the muscles of the abdominal walls, these acting, as he shows, with greater effect upon the rounded back and nates of the child than they could upon the head, did the head present. Mauriceau seems also to have some indistinct and inaccurate idea of the rotation which occurs in the pelvis; for, after stating that, in footling cases it is necessary that the face in its descent should look backwards, he gives directions for turning the child during its descent, *unless this has already taken place*, so as to make the heels look directly forward.

Any one who may wish to pursue this subject further, will find ample and most interesting material in the works of Peu, Dionis, Deventer, La Motte, Puzos, Roederer, Levret, and others. In many of these, new errors are developed, such for example, as the undue importance given to uterine obliquities by Deventer and his followers, who supposed them to be a frequent cause of tardy labor. The rediscovery of the midwifery forceps by the Chamberlens, about the middle of the seventeenth century, marks another and a most important epoch; but this will fall to be more particularly considered when we come to discuss the forceps and its uses.

The interesting subject of the mechanism of parturition was inaugurated little more than a hundred years ago by Sir Fielding Ould, of Dublin, and this, too, is another important era in the history of Midwifery. To trace the successive steps, from the faint glimmering of the truth which perplexed the shrewdness of Ould, and baffled the astuteness of Smellie, to the full development of the modern theory as it was laid before the scientific world in the celebrated essay of Nägele, would lead us upon ground, which for the present we must avoid. In the sequel and at the proper place, such of the historical facts as are essential to the comprehension of this subject will be briefly noted.[1]

It seems, on first sight, a paradox that the practice of midwifery should involve, in the human species, the supervision of a function which is purely physiological, and should be claimed by its professors as an important branch of the healing art. So difficult, indeed, has this problem been of solution, that many, from Rodericus á Castro downwards, have asserted that the practice of the art was derogatory to professional dignity, and an unnecessary interference with a natural process. "Obstetriciam artem nec exercui nec exercere volo," wrote one of these; and there is reason to believe that the words find an echo even now. We need scarcely pause to refute the former of the two objections. We presume we may hold it as proved that, from the very earliest times, women required and obtained assistance at the period of delivery. This assistance was afforded, as we have already seen, by persons of their own sex, and that there is a fitness in this no one will gainsay. If we may judge, however, from the Athenian laws, we may assume that the practice of obstetrics did not prosper in the hands of women; but it must be confessed that there is evidence enough in the works of Arsinoe and Cleopatra, to prove that some of them, at least, were quite familiar with the doctrines and practice of their age. And it must be conceded further, in these days when women are knocking so loudly, and with such importunity, at the portals of professional knowledge, that if the mantle of Mesdames La Chapelle and Boivin could be made to fall on the shoulders of their sisters of the present generation, female delicacy would be saved many a rude shock, and the cause of science would in no sense suffer. But what do they say who repudiate the general practice of the art? Women, they assert, should in their hour of need be attended by women, and only in the case of difficulty or danger should the male accoucheur be summoned. The answer to this simply is, that the assistance of the latter would, under such circumstances, be of no value whatever, as without a knowledge of the healthy or normal standard, which can only be attained by the constant observation of the natural process, ignorance, not skill, would be called upon to act. To the full as rational would it be to ask him to compute distance or space who had no knowledge of the standards of lineal measurement or capacity. Certainly, in the present day, men are required for the practice of midwifery, skilled in medicine and the allied sciences, and who do not think of their dignity, any more than of their ease and comfort, when their services are in this matter required.

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[1] For a critical analysis of this subject, see an essay by the author "On the Mechanism of Parturition." London, 1864.

In regard to the other objection, we must, of course, admit that parturition is a physiological function. But, in the discharge of this function, there exist in the human species peculiar conditions which exercise, as compared with the lower animals, a special influence upon the progress and issue of labor. What these conditions are will be best understood by a reference to one or two points in comparative anatomy, which reveal certain analogies, the appreciation of which will clear away many difficulties, and a knowledge of which is, in point of fact, almost essential to the student of midwifery.

At an early period of mammalian development, two rods or bars of cartilage may be observed passing more or less obliquely, from the dorsal towards the ventral surface of the embryo near its caudal extremity.[1] The two parts are separated at their dorsal extremity, where they embrace the vertebral column; while in front, in most cases, they meet and form a *symphysis*. This is the primitive pelvis. As the process of development goes on, the cartilage of each side ossifies from three centres, by the union of which the *os innominatum* is formed, the

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[1] See Power's "Osteology of the Mammalia." London, 1870.

two lower segments—*ischium* and *pubes*—leaving a gap between them, the *obturator* or *thyroid* foramen. If we except the Cetacea and Sirenia, in which the pelvis is almost rudimentary, these characteristics are common to the whole mammalia. The innominate bones are firmly united above to the sacral vertebræ, and usually below to each other at the *symphysis;* and this union, firm as it is, is greatly strengthened by a double ligamentous union of considerable strength between the sacral and caudal vertebræ on the one hand, and the ischium on the other. This is familiar to anatomists as the greater and lesser sacro-sciatic ligaments, which are sometimes replaced by bone—as in the sloth.

The mammalian pelvis, then, by the union of the two innominate bones and the sacrum, forms, with some exceptions, a complete circle or girdle of bone; or, in other words, an osseous canal or tube which has two outlets. Of those, the anterior is called the *inlet* or *brim*, which is marked more or less distinctly by a line which runs from the top of the symphysis pubis to the first sacral vertebra. The axis of this is, owing chiefly to the obliquity of the innominate bone, probably never parallel to the vertebral column, but diverges from it more or less widely, according to what is termed the inclination of the brim. The *outlet* looks backwards or downwards according to the position of the animal, and is bounded in the dorso-ventral diameter by a caudal vertebræ on the one side, and the lower margin of the pubic symphysis on the other, and laterally by the great sacro-sciatic ligaments (or bones) and the converging borders of the ischia. As the planes of brim and outlet are never quite parallel, the axis of the pelvis is consequently more or less of a curve.

A careful study of the form, and extent of development, in the various mammalian groups, shows clearly that, as in other parts of the skeleton, the ever-watchful provision by nature of means to an end is here strikingly exemplified. In the Cetacea, where there are no pelvic limbs, the pelvis is composed of two slender bones ununited inferiorly; the chief use of which seems to be to afford an attachment for the crura of the penis and clitoris. In the Armadillo it is strong and powerful, to aid in the support of the exo-skeleton. In the Carnivora, the ilium and ischium are in a straight line and of nearly equal length, the pelvis being thus elongated and narrow. The symphysis is long, includes part of both pubes and ischium, and, in adult animals of this class, is usually closed by anchylosis. In the Seals, the pelvis is small, and of a different form from the terrestrial carnivora, the ilia being small, and the ischia and pubes long and slender. The symphysis is small and loose, admitting of being widely separated during parturition.

In many of the Insectivora, the symphysis is absent, the bones being widely separated in the middle line. The pelvis of the mole, for example, is long and narrow, and its axis is nearly parallel with the vertebral column. The ischium, as well as the ilium, is united to the sacrum by anchylosis, and the brim is so narrow that, there being no union at the symphysis, the pelvic viscera lie external to the cavity, and parturition takes place beneath rather than through the pelvic canal. In the Rodentia the pubes and ischia are always largely developed, flat, and diverging posteriorly, while the symphysis is long and usually osseous. The guinea-pig is an exception, as here the union remains ligamentous, and admits of free opening during labor.

In the order Ungulata, the Pecora or true ruminants are characterized chiefly by the great development of the ischial tuberosity, forming a well-marked conical process which is diverted outwards on each side. The symphysis is long, and includes a considerable portion of the ischia, and large epiphyses are observed, forming the articulating surfaces. These parts ultimately become fused by anchylosis. In the Perissodactyla, the greater expansion of the ilia, as seen in a marked degree in the skeleton of the elephant, indicates, at first sight, an approach to the human type; but the narrowing of the pelvis as it approaches the acetabulum, and the comparatively small ischial and pubic portions, at once dispel the illusion.

The Edentata have the pelvis more or less elongated, and the ischia largely developed. In almost all, the ischia are directly connected with the vertebral column by one or more osseous bridges, the single one in the sloth passing from the ischial spine, and thus representing the lesser sacro-sciatic ligament. This is carried to the greatest extent in the Armadillos, where a long unyielding tube is formed by the coalescence of the ilium and ischium on the one hand, and a considerable number of sacral and pseudo-sacral vertebræ on the other. In most of the Edentates, not only the sacro-iliac articulations, but also the symphysis pubis are anchylosed.

The Marsupiala and Monotremata are characterized by the great development of the ischia and pubes, and the development in the tendon of the external oblique muscle of the "marsupial" bones, the function of which is associated with the peculiar development which obtains in these animals.

The facts here cited will suffice to show that the pelvis, in the various groups into which the mammalia have been divided, is formed so as to suit the requirements of the individual. The mode of locomotion, be it leaping, running, or swimming, is revealed to the anatomist by an examination of the pelvic bones, and in every case it will be seen that the preponderance of ilium, ischium, or pubes, is due to the necessity which exists for certain mechanical arrangements, by which alone can the required muscular power be effectively applied to the bony levers. The pelvis is also an efficient support to those organs which are usually contained within it, and especially to those which are connected with the function of generation.

The obstetrician, however, looks at the pelvis from a different point of view. In it he sees the osseous canal through which the product of conception must pass in the act of parturition. He sees in it also the protecting framework which shields the generative viscera from the effects of shock or injury. And, above all, he studies it as a structure which, if abnormal, may seriously obstruct the process of parturition. Let us look, then, for a moment, before quitting the subject, and from this standpoint, at the pelvis of the mammalia. Throughout the whole series, irrefragable evidence is afforded that the pelvis is designed with a direct reference to the propagation of the species; and we find, moreover, that, on the approach of labor, certain modifications of structure which then occur clearly prove that nature prepares the parts beforehand for the new function. Thus, in the Chevrotains, a group of little deer-like animals, formerly associated with the musk-deer, the ischia in the males join the elongated sacrum by ossification of the sacro-sciatic ligaments, but in the females the latter retain their normal extensile texture. In the prolific guinea-pig, again,[1] the pelvis is long and laterally compressed, the passage being much narrower than the diameter of the head of the mature fœtus. About three weeks before parturition, the interpubic ligaments become soft and extensile, so that during labor the innominate bones separate from each other at the symphysis, the sacro-iliac joint thus becoming on each side a hinge. After this process, the symphysis quickly returns to its normal or former state, and in a few days presents only a little thickness and mobility. The young of the guinea-pig are far advanced at birth: some of the deciduous teeth are shed *in utero*, and they run about and begin to eat soon after they see the light.

FIG. 1.

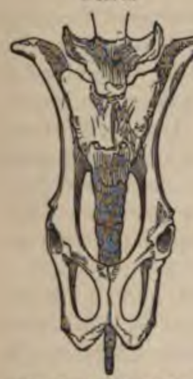

FIG. 2.

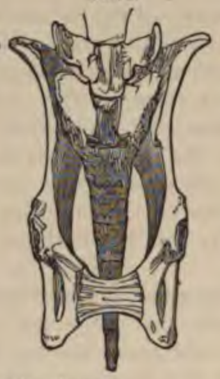

FIG. 1.—Pelvis of the female guinea-pig.

FIG. 2.—The same; showing the separation of the bones during parturition.

In the cow, as the period of parturition approaches, a relaxation of the pelvic ligaments also occurs, but the process here is different.[2] The gradual upward curve and posterior projection of the ischia causes the well-marked dorsal projection of their tuberosities, which appear prominently on the rump, projecting on each side and above the coccygeal vertebræ. By this elevation of the ischia, the sacro-sciatic ligaments become a means of support to the pelvis, so that their action is, as compared with the corresponding structure in the human pelvis, as it were inverted. As the period of utero-gestation approaches its termination, these ligaments, as well as those of the sacro-iliac joint, become relaxed to such an extent that the sacrum is observed to sink downwards between the innominate bones, so that the ischial tuberosities become very prominent, and relatively elevated. The object of this is manifestly to render parturition easier. Did this, indeed, not occur, there can be little doubt that in the cow, as in some other ruminants, the difficulties of labor which occasionally arise would be of much more frequent occurrence. It is interesting to observe, as the probable cause of dystochia in those animals, that owing to the greater curve of the sacrum, the axis of the pelvis is necessarily more strongly curved than usual, and in this respect approximates to the human type.

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[1] Owen. Comparative Anatomy and Physiology of the Vertebrates.

[2] Todd's Cyclopædia of Anatomy and Physiology. Supplement. 1859. Art. Pelvis.

If we now turn to the Primates, we shall be able to show, by a comparison of the human race with those of the mammalia which stand nearest to it in the scale, that the process of childbirth must be more difficult and more obnoxious to serious hindrance than in any—even the highest—of the other mammalia. In all the Simiina the ilium is, as compared with man, much elongated. "Each os innominatum in the adult male gorilla," says Owen, "is one foot three inches in length, that of man being seven inches and a half; the breadth of the ilium is eight inches and a half, that of man being six inches." In the lower forms—as the baboons and monkeys—the ilium is even longer, relatively to the other bones of the pelvis, than is here described. The ilia are nearly in a straight line with the vertebral column, and the inferior rami of the ischium are directed almost horizontally inwards, entering into the formation of the pubic symphysis, which, in the ape tribe generally, may be more properly called the *ischio-pubic* symphysis. The form of the cranium is the familiar and ready test, not only in distinguishing between man and the lower animals, but also between the various races of mankind. It is peculiarly interesting to us, however, to observe that a careful examination of the pelvis will also supply the same and as reliable information. The chief peculiarities of structure which are exhibited in the case of the highest of the Simiina have just been noticed. In addition, we observe that the *depth* both of the true and false pelvis is much greater than in the human race, that the sacrum is much narrower, especially in the Chimpanzee, that the ischial spines are more closely approximated, and, above all, that the antero-posterior measurements at the brim prevail greatly over the transverse.

Were we to compare the highest Ape with the lowest Man, we would find the following broad points of distinction. In the Ape, a pelvis with the brim much more inclined, its antero-posterior exceeding its transverse measurement; a bending of the pelvic brim at the ilio-pectineal eminence forming an angle of about 120°, called the *ilio-pubic angle*—a characteristic which, without exception, distinguishes the lower animals possessing pelves; a marked elongation of the ilia; and a parallelism of the symphysis with the vertebral axis. In Man, less inclination of the brim, and a constant preponderance of the transverse over the antero-posterior diameter; the boundaries of the brim here alone in the animal kingdom *on one plane;* great expansion of the ilia, as compared with their length; and the symphysis bent at an angle with the vertebral column. The import of this great gap in development is evident, and has its explanation in the adaptation of man alone of all created beings *to the erect posture.*

The descriptive anatomy of the human pelvis will form the subject of another chapter. We shall here glance only at its special functions, in so far as they may be held to differ from those of the lower animals. In all the other mammals the habitual and only natural position or posture of the animal is prone,—the dorsal surface being superior, the ventral inferior. In all those in which pelvic limbs exist, the weight of the posterior or pelvic portion of the trunk alone is transmitted through the pelvis to the cotyloid cavities, and thence transferred to the heads of the thigh bones. In Man, the whole weight of the body above the pelvis is directly transmitted to it by the imposition of the last lumbar vertebra on the base of the sacrum, from which again it is transferred, when the body is erect, to the femora, and in the sitting position, to the tuberosities of the ischia. To enter upon an analysis of the mechanical laws upon which this depends would be suitable to a work on animal physics, but we must here confine ourselves to such points only as are germain to our subject.

The sacrum—which is relatively much broader and stronger in man than in any of the lower animals—is the part which receives the weight of the trunk, the centre of gravity being, according to Weber, 8.7 millimetres above the sacro-lumbar joint, or just above the pelvic arch. It has been compared by Cruveilhier to a wedge, by others to the keystone of an arch, and by Sir Charles Bell to the heel of a mast,—the base of the vertebral column being fixed so that the interval between the innominate bones may be looked upon as the *step* in which the vertebral mast is socketed and mortised. In any case we may consider the weight as being transmitted from the sacro-iliac joints in one of two directions: in the erect posture, it passes through the irregular, thick, and curved buttresses which are formed by this portion of the ilia directly to the cotyloid cavity; in the sitting posture it passes, on a posterior plane, from the joint almost directly downwards to the tuberosity of the ischium. The sacrum is thus described as forming the common culminating point of two arches, viz.: the *cotylo-sacral* or *standing arch*, and the *ischio-sacral* or *sitting arch*. The extremities of these arches are prevented from starting outwards, not by abutments as in the ordinary architectural arch, but by connecting links or *ties*, which are represented in the cotylo-sacral arch by the horizontal rami of the pubes, and in the ischio-sacral by the united ischio-pubic rami. This complicated arch acts also by preventing inward pressure in the erect posture by the head of the femur, while shock is in a great measure prevented by the oblique manner in which the sacrum is placed—the sacro-sciatic ligaments preventing the movement of the coccyx upwards and backwards, while the ilio-lumbar ligaments prevent the corresponding motion of the base of the sacrum downwards and forwards.[1] The expanded external surfaces of the ilia give attachment to the mass of the glutei muscles, more powerful, for obvious reasons, in man than in any other animal.

But the pelvis has, in addition to the elaborate mechanical functions above shortly alluded to, a new and special function thrown upon it in Man. This is the support of the pelvic viscera, including the organs of generation. These latter being larger and heavier in the female, and, in view also, no doubt, of the requirements of the pregnant state, nature here makes special provision for their accommodation, in the greater capacity and modified form to which we shall afterwards advert. In the lower animals, the abdominal viscera, and, to some extent also,

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[1] Dr. Matthews Duncan, in his "Researches on Obstetrics" (p. 55), shows more correctly, that the weight is transferred from the sacrum to the cotyloid cavity, not directly, but indirectly through the agency of the posterior ilio-sacral ligaments.

Fig. 3.

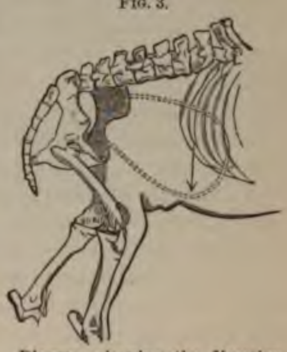

Diagram showing the direction in which the uterine contents gravitate in the Mammalia generally.

the pelvic viscera, are supported by the lower abdominal wall. The contents of the pregnant uterus, therefore, gravitates downwards, in the direction of the arrow in the figure, and, under no circumstances, does the weight of the uterine contents press into the cavity of the pelvis. Even in the Simiina, where the erect posture is to some extent assumed, the greater inclination of the pelvic brim prevents the gravitation of the uterus and its contents into the true pelvis. In a pregnant woman, on the other hand, not only are the pelvic viscera proper supported by the structures which form the floor of the pelvis, but some support is indirectly afforded to the abdominal viscera under certain circumstances. In the pregnant state, the uterus and its contents gravitate downwards and backwards, directly, or almost directly, in the axis of the brim.

The necessity which thus exists for efficient pelvic support to these parts has not been overlooked. Were the pelvis a simple tube, with the inlet looking upwards, and the outlet downwards, it is obvious that no efficient support could be afforded. But the tube, far from being straight, is in a woman strongly curved—so strongly indeed, that a line drawn so as to represent the axis of the brim and the long axis of the uterus (which we may here assume to be identical), will not fall within the plane of the outlet at all, but behind it, somewhere about the centre of the coccyx. By this curve in the pelvic axis, the lower part of the sacrum, the coccyx, the sacro-sciatic ligaments, the *levatores ani* and *coccygei* muscles, and the fascial and soft structure, form a firm *floor*, by which, in a normal and healthy condition of the parts, perfect support is given to the structures of which we have spoken. But this manifest advantage is obtained at the price of increased difficulty in the act of parturition. This difficulty is, no doubt, to a very great extent, compensated for by the development of the subpubic arch, a peculiarity of the human species which is but imperfectly developed in the lower animals. Without this, indeed, and that shortness of the symphysis in women which admits of its widest development, labor would be always difficult, and often impossible.

The function of the pelvis being thus in every case a complicated one, is so in the human female in an especial degree. The unyielding nature of the structure, essential to the effectual support of the trunk, and the curving of its cavity for the reasons above stated, render childbearing in this instance exceptionally liable to dangers of various kinds, and thence arises the necessity for that thorough training which can alone engender confidence and develop skill.

The comparative facility with which parturition is effected in the lower races of the human species has also been used as an argument against the practice of midwifery. In reference to this objection, on which we need not dwell, there can be little doubt that the effect, in certain classes of society, of modern and luxurious habits, exercises no inconsiderable influence upon the physiological phenomena of parturition. As regards the difference between the races, many very interesting facts have been revealed by the researches of Vrolik, Weber, and others, but there is still in this direction a wide field for original investigation. The facts which have already been disclosed point to the important conclusion, that there subsists in the various races a remarkable coincidence between the prevailing form of the skull and the diameter of the pelvic brim, and that, consequently, the adaptation of the fœtal skull to the pelvic passage during labor must be greatly facilitated. Weber's conclusions, drawn from the observation and measurements of a considerable number of specimens, are, that we may admit as the general rule, subject however to numerous exceptions, that the oval shape is most common in Europeans, the round shape in the American aborigines, the square shape in the Asiatic or Mongolian type, and the oblong in the Negro races. As regards the assumed facility of labor in those races, there is every reason to believe that this has been greatly exaggerated, and that cases of dystochia are of frequent occurrence, although, perhaps, comparatively rare. If the pelvis were the same in size and proportion in them as in Europeans, the inferior cranial development would afford an obvious explanation of the alleged fact of habitually easy labors. So far, however, from this being the case, we have just seen that the form of the pelvis corresponds to the shape of the head. An examination of Negro, Bushman, and other pelves, shows in many instances a remarkable degradation of type, such as a vertical direction of the ilia, and their elevation at the posterior-superior spines, narrowness of the sacrum, and acuteness of the subpubic angle. An occasional peculiarity in some of the lower races, and one which appears even more to approach to the ape-type, is the preponderance of the conjugate over the transverse diameter of the brim. But they who have asserted that the lower races referred to simulate in this respect apes rather than Europeans have gone too far, as is clearly proved by the measurements given in the admirable article on the Pelvis in Todd's Cyclopædia, already quoted. From this it appears, that while the transverse may, in the higher Simiina, measure less than the conjugate diameter by one and a half to two inches, the difference in cases of oblong pelvis in negroes is merely fractional, and that the type is in every case far more closely allied to the European than to the Simian, where the conformation of the pelvis is such, even in the highest forms, that its marked peculiarities are appreciated at a glance.

Whether the pelvic articulations in women are, or are not, divaricable during parturition, is a question obviously of great practical importance to the accoucheur. Involving, indeed, as it does, practical considerations, this is a subject, the study of which might here be considered premature. But, in view of the facts which have just been stated in relation to the comparative anatomy of the pelvis, this vexed question may, we believe, be noticed with more advantage at this stage than at any other. In so far as a study of the physiological phenomena of labor in the lower animals can throw light upon the subject, we have already seen that separation may take place to a very considerable extent at the symphysis, as in the guinea-pig, or at the sacro-iliac joint, as in the cow. So far, then, analogy points to the possibility of such a separation. Besides, anchylosis of either one joint or the other, common as it is in the lower animals, is known to be, in the human species, an extremely rare occurrence.

Actual observation, again, by men of such undoubted authority, among many others, as Paré, Levret, and Smellie, has proved, beyond all possibility of doubt, that in women who have died during the parturient period, separation of the bones, now at the symphysis and again at the sacro-iliac joints, has been seen and recorded. Few practitioners of extended experience have failed to observe that women occasionally complain, especially after severe labor, of pain in the neighborhood of these joints, difficulty in walking for a considerable period after delivery, and, more rarely, a grating or crepitant feeling, arising apparently from an unwonted motion of the articulating surfaces upon each other. From which we may conclude that separation *may*, to some extent at least, occur. Cases such as have been detailed by Soemmerring—where the bones at the sacro-iliac joint have been found separated to the extent of an inch—have been supposed to be the result of disease and deposit of pus.

Admitting, then, that some separation may occur, are we to assume that this is to be held as morbid or abnormal, or admitted as one of the essential physiological phenomena of human parturition? It is, we suppose, now universally believed, that, during the last months of pregnancy, the cartilaginous and other structures forming these joints, to be hereafter described, become softened, as if by serous infiltration. The synovial membranes, indistinct before, now become capable of demonstration; and, more important, perhaps, than all, the tissues become thickened, while the ligaments of the joints are relaxed. The effect of such thickening must, of necessity, be, like ivy roots in a wall, to force the bones asunder and, consequently, to increase the pelvic diameters. If, however, there is, as has been asserted, a yielding much more extensive than this, such motion may be assumed to occur in one of two ways: either by a separation of the pubes, involving a hinge motion at the sacro-iliac joint, as in guinea-pigs; or by a movement of the sacrum between the ossa innominata, involving a hinge motion of the symphysis, as in the cow. As regards the first of these, a careful examination of the circumstances under which it may occur, would seem to indicate that a separation of the pubic bones to the extent even of an inch would add very little to the diameters of the brim, and would contribute least of all to the smallest or conjugate diameter. The analogy which the frequent yielding of the symphysis seems to reveal, gave rise, about the end of the last century, to an operation consisting in the artificial section of the symphysis in cases of obstruction at the brim—a mode of procedure which Dr. Matthews Duncan seems to think has been in these days too completely consigned to oblivion.

The other method in which the pelvic capacity may be increased by a movement of these joints, is by the motion of the sacrum between the ossa innominata, somewhat as it has been shown to occur in the cow.[1] From what has already been said, it may be inferred, that to compare the sacrum either to a wedge or a keystone is very far from accurate. We have seen that this bone is maintained in its position in a great measure by the ilio-lumbar and sacro-sciatic ligaments—the former preventing, or rather strictly limiting, along with other forces, the downward and forward movement of the promontory; while the latter limits, in like manner, the upward and backward motion of the coccyx. Now, these ligaments share in the general relaxation of the pelvic structures towards the end of gestation; and thereby we may assume, that the movement or oscillation on its transverse axis, of which the sacrum is capable, and which is said by Zaglas to be about a line in the unimpregnated condition, is, in the last months of pregnancy, considerably increased. The manner in which this oscillation of the sacrum takes place in different positions of the woman is clearly shown by Zaglas. "In the erect position, the promontory of the sacrum is not in the position of greatest projection into the brim of the pelvis, but the reverse; and, consequently, the apex is in its forward position, diminishing the outlet and relaxing the sacro-sciatic ligaments. When the body is bent forward, on the other hand, the base of the sacrum is protruded into the brim, the apex is tilted upwards, the sacro-sciatic ligaments put on the stretch, and the outlet of the pelvis consequently enlarged. These movements take place, ordinarily, both in man and woman, in defecation, &c., but in her they are of greatest interest and importance in the function of parturition.[2] The experiments of MM. Giraud and Ansiaux seem to show that, in contracted pelves, those movements take place to an even greater extent, as if nature were doing her utmost to obviate the disastrous effects of pelvic deformity. Dr. Matthews Duncan, in his admirable essay on this subject, points out, with great clearness, the very remarkable manner in which these alterations correspond with the phenomena of the progress of the child in parturition. In the first stage of labor, for example, when the head is passing through the brim, the woman prefers the standing, sitting, or reclining posture, in which the brim of the pelvis is, as we have seen, kept open at the expense of the outlet (see Fig. 4); but in the second stage she bends her body forwards, draws up her legs, and calls into action the abdominal muscles, which act by tilting up the symphysis; in a word, her posture and voluntary efforts are now precisely those which may most effectively increase the conjugate diameter of the outlet by tilting

FIG. 4.

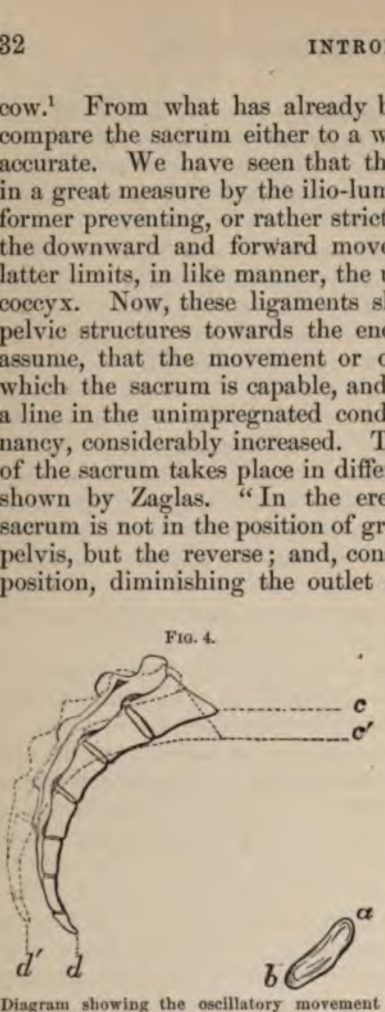

Diagram showing the oscillatory movement referred to (Matthews Duncan).

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[1] Barlow. Monthly Journal of Medical Science. January, 1854.

[2] Matthews Duncan. Op. cit., p. 142.

back the coccyx. To the motion of the sacro-coccygeal joint, which is universally admitted, we need not at present specially advert.

From these and other facts disclosed up to the present time we conclude: 1st. That, in the last months of pregnancy, a marked relaxation and softening of the pelvic articulations takes place.

2d. That, as the result of this modification in structure, an increased, though limited, mobility is permitted, which tends to facilitate labor.

3d. That, in addition to the movement of the sacrum on its transverse axis, as above noted (and which may be considered as peculiar to the human species), the manner in which the joints yield is probably very similar to what obtains in the case of the cow. The sacrum acts in this case as a wedge separating the ossa innominata, and causing the symphysis to open with a hinge motion, while, during the violent efforts of labor, the whole sacrum may probably be driven backwards to a trifling extent. Separation of the bones at the symphysis has undoubtedly been observed, but this is probably the exception, while the other is the rule. The development of the synovial membranes seems, when taken along with the above facts, to warrant the conclusion arrived at by Lenoir, "that the articulations of the pelvis proper should not be considered as *amphiarthroses*, but as *arthroses*."

The word "Midwifery," it is proper here to state, is employed in this work in the more extended sense in which it is used by Rigby and other English authors, and not in the limited sense which is implied by the French *accouchement*, and the German *Geburtshülfe*. It signifies, therefore, that Science and Art, which has for its object the management of woman and her offspring during Pregnancy, Labor, and the Puerperal State.

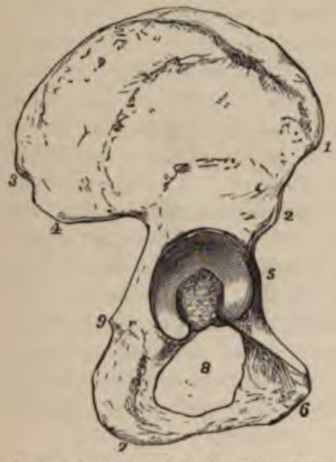
CHAPTER II.

THE PELVIS.

OS INNOMINATUM: SACRUM: COCCYX—THE PELVIS AS A WHOLE: "TRUE" AND "FALSE"—DIFFERENCE BETWEEN MALE AND FEMALE PELVIS; AT BRIM; IN CAVITY; AND AT OUTLET—PELVIC ARTICULATIONS: (*a*) PELVI-LUMBAR; (*b*) SACRO-COCCYGEAL; (*c*) SACRO-ILIAC; (*d*) SYMPHYSIS PUBIS; (*e*) OBTURATOR LIGAMENTS; (*f*) SACRO-SCIATIC LIGAMENTS—INCLINATION OF PELVIS—AXIS OF THE TRUE PELVIS—BRIM OR INLET—CAVITY—OUTLET—PELVIC DIAMETERS—PELVIC ANGLES—DEVELOPMENT OF PELVIS—CERTAIN SOFT PARTS CONNECTED WITH PELVIS; OBTURATOR INTERNUS AND PYRIFORMIS MUSCLES; "FLOOR" OF PELVIS.

THE Pelvis, as has already been incidentally remarked, is composed in Man, as in almost all the other Mammalia, of three parts: 1st, an *os innominatum*, formed by the union of three principal pieces, the *ilium*, *ischium*, and *pubis*, and some other epiphysial parts, the complete fusion of which into one mass is only complete about the twentieth year; 2d, the *sacrum;* and 3d, the *coccyx.*

FIG. 5.



External surface of right os innominatum.

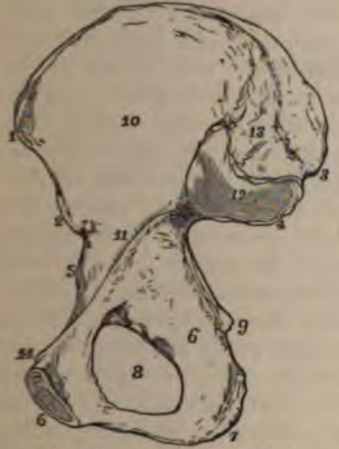
The *Os Innominatum* on its external surface exhibits the remarkable expansion of the ilium which constitutes one of the distinguishing features of the human race. This large surface serves to give attachment to the powerful glutei muscles. Its superior margin is called the crest of the ilium, the projections at 1 and 2 the anterior, and those at 3 and 4 the posterior spinous processes. The acetabulum, a deep cavity for the reception of the head of the thigh bone, also called the cotyloid cavity, with its synovial depression and pit for the reception of the round ligament, is shown in the centre of the figure. 5, marks the pectineal or ilio-pectineal eminence, a point of some importance in midwifery, and the other parts indicated are: 6, the symphysis pubis; 7, the tuberosity of the ischium; 8, the thyroid or obturator foramen; and 9, the spine of the ischium, which divides the great posterior gap into the greater and lesser sciatic notches.

In the view of the internal surface of the innominate bone, the figures 1 to 9 indicate the same parts as in the preceding cut; 10, is the iliac fossa; 11, the ilio-pectineal line or brim of the true pelvis; 12, auricular cartilaginous surface of the sacro-iliac joint; 13, rough tuberculated surface for the posterior sacro-iliac ligaments; 14, spinous process of the pubis, terminating the crest of the pubis and the ilio-pectineal line. The relative position of the rami of the ischium and pubis, and other points familiar to the anatomist, are clearly shown in both figures.

The *Sacrum* is an irregular, wedge-shaped, or triangular bone, formed by the fusion of five vertebræ, and is more or less curved with the concavity forwards, the base of the triangle being upwards. It is placed below the last lumbar vertebra, above the coccyx, and between the ossa innominata, and forms the upper and back part of the pelvis. It is in man stronger, and relatively larger, than in any other animal, this characteristic being specially marked in the female. The external or posterior surface is convex and rough, and there are four, and sometimes five processes placed below each other in the median line, representing the spines of the original vertebræ. On either side, four foramina are observed, through which the posterior sacral nerves pass from the *cauda equina,* which is contained in a longitudinal canal, the continuation of that of the vertebral column. Below the last spinous process is a triangular opening, which is the termination of the vertebral canal, and of which the lateral margins terminate in a pair of tubercles, known as the sacral cornua, which project downwards, and articulate with the cornua of the coccyx. A row of tubercles is seen on the inside, and another on the outside of the foramina, which correspond to the articulating and transverse processes of the vertebræ.

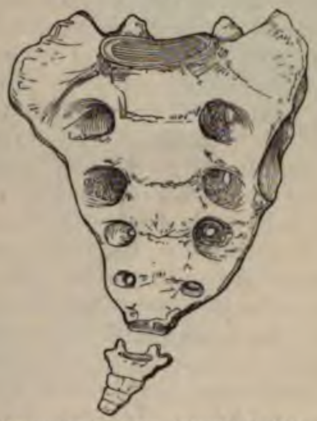
The pelvic or anterior surface (Fig. 7) is concave from above downwards, and slightly so from side to side, and is much smoother than the posterior. Four foramina, larger than those above described, are provided for the transit of the anterior sacral nerves, and between these foramina are four ridges indicating the boundaries of the original vertebral constituents of the bone.

FIG. 6.



Internal surface of the same bone.

FIG. 7.



Sacrum and coccyx—internal surface.

Laterally, there is presented anteriorly an uneven surface of considerable size, covered in the recent state with cartilage, and corresponding to the iliac articulating surface shown at 12, Fig. 6. This is called, from its shape, the auricular surface, and behind it there is an extremely rough and uneven surface for the attachment of the posterior sacro-iliac ligaments. Below and behind this, the irregular surface gives attachment to the sacro-sciatic ligaments.

The oval surface of the sacrum, which, looking upwards and forwards, represents the base of the bone, is articulated, through the medium of the interarticular disk, with the last lumbar vertebra; while its narrow inferior extremity, transversely oval, is jointed with the superior surface of the Coccyx.

The *Coccyx*, the rudiment of the caudal vertebræ, generally consists of four small vertebral pieces tapering downwards to a point. It derives its name from a fancied resemblance to a cuckoo's beak, and is placed so as to continue, anteriorly and posteriorly, the curve of the sacrum. An oval surface (covered with cartilage and furnished with a synovial membrane) articulates with the apex of the sacrum, and this union is strengthened by two small processes which project upwards to meet the cornua of the sacrum. Not only is the sacro-coccygeal joint a perfect hinge, but the various bones of which the coccyx is composed also admit of some motion in early life the one upon the other. In adult life these bones are generally anchylosed, and the sacro-coccygeal joint in males generally, and in females occasionally, lost, so that the sacrum and coccyx are firmly joined together.

The superior mobility of these parts in women is universally admitted as an important mechanical advantage in the process of parturition, the antero-posterior diameter of the outlet being by this resiliency increased, under ordinary circumstances, by an inch, or even more. Usually, during the childbearing period, the parts are in the condition of complete mobility as regards the sacro-coccygeal joint, and yielding also between the first and second bone of the coccyx, while the last three bones are united.[1] In this respect, however, great irregularities exist, and sometimes, even in women who are still young, complete anchylosis is observed. The result of this is, of course, a very considerable impediment to delivery, and many cases are recorded where, during the use of instruments, or even in the course of ordinary labor, a fracture of the bones thus anchylosed has occurred. Premature fusion of this articulation, and malformation of the coccyx, are conditions by no means very uncommon. The usual form assumed in the latter case is projection forwards, encroaching upon the conjugate diameter of the outlet; but a projection of the coccyx backwards has also been noticed by the writer and others, a condition which is interesting as an anatomical peculiarity, but is rather favorable than obstructive to the course of natural labor. In cases of fracture, care must be taken, during the reparative process, to prevent union in such a position as to constitute a possible impediment to delivery in subsequent labors.

The Pelvis as a Whole.—The pelvis is thus formed by the union of several pieces, the articulations or points of junction being, in front, the *symphysis pubis*, and, behind, the *sacro-iliac* and *sacro-coccygeal* joints. These articulations are greatly strengthened by certain ligamentous structures, which will be presently described.

It is divided into two parts by a line, the various parts of which are in man alone on the same plane. This line, known as the *brim* or *inlet* of the pelvis, runs on each side from the symphysis pubis outwards and upwards, forming an irregularly oval constriction of the osseous canal. Various points in the course of this line, which divides the superior or *false* from the inferior or *true* pelvis, are of special interest to the obstetrician. In the middle line anteriorly is the symphysis pubis. Diverging right and left from this point, are the pubic crests terminating in the pubic spines. The finger, on being passed around, next touches the *pectineal* or *ilio-pectineal eminence*, then the ilio-sacral articulation, and finally the projection known as the *promontory* of the sacrum. This last point is of paramount importance, as the degree of projection which forms the promontory exercises a most important influence on the progress of a case of labor.

The true pelvis, then, includes the whole of that part of the structure which is below the brim as far as the *outlet*, the space comprised between the two being the *cavity*. Each of these parts requires careful and separate consideration; but, before passing to this part of the subject, it is advisable that the striking contrast between the male and female pelvis, having an obvious relation to the function of parturition, should be noticed.

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[1] Cazeaux asserts that the sacro-coccygeal articulation ossifies generally before the first and second bones become united. If this is correct, the mobility in these cases must manifestly be impaired.

The female differs from the male pelvis in the first place by the comparative slenderness of the bones, as is well seen in the rami of the ischium and pubis, and also by the greater smoothness of the surfaces to which muscles are attached. The chief points of distinction, as viewed from before, are well shown in Figs. 8 and 9, in both of which the numbers 1 and 2 represent the extremities of the widest transverse diameter of the upper or false pelvis; 3 and 4 are the acetabula right and left; 5, 5, the thyroid or obturator foramina; and 6, the subpubic angle or arch. The differences exhibited are those which exist between an ordinary male and female pelvis in middle age: in neither case is there anything exaggerated or unusual. The greater distance in Fig. 9 between the acetabula, the wider and shallower true pelvis, the triangular form of the obturator foramen, the greater width between the tuberosities of the ischia, and the greater span of the subpubic arch, are the chief points which at a glance show it to be a female pelvis. The last-mentioned point of distinction is very characteristic in well-formed pelves, the angle in males being no more than 75° to 80° while in the female it reaches from 90° to 100°.

FIG. 8.

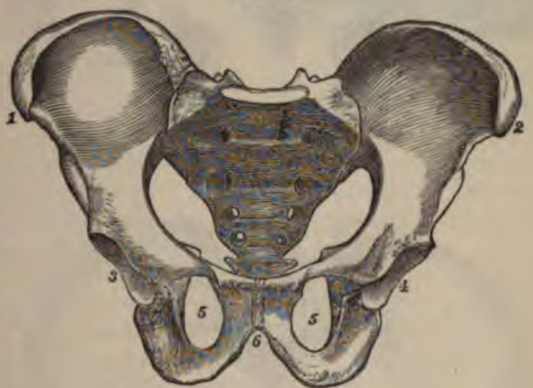
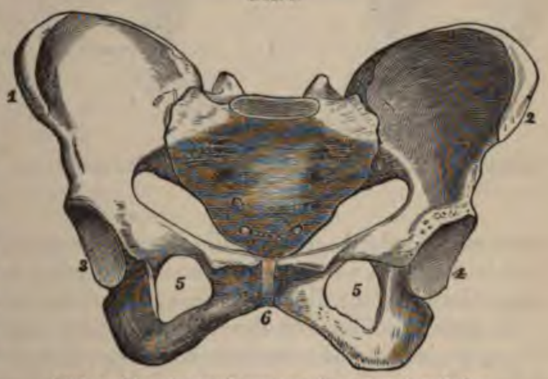


FIG. 9.



Male and female pelvis contrasted, as seen from before.

Viewed from above and in front, at right angles to the brim of the true pelvis, the contrast is scarcely less marked. In the lower of the two figures showing this view, the further peculiarities of the female pelvis are evidenced by the greater expansion of the ilia, the minor degree of projection of the promontory of the sacrum, and the marked general increase in the diameters. In the cavity, the most noteworthy feature of the female pelvis is the diminution in the perpendicular depth, the symphysis being in the male nearly double the depth, while the sacrum is shorter as well as broader, and placed so as to offer a more ample concavity. It will also be noticed, in looking downwards and backwards, as is shown in Figs. 10 and 11, that three projections are seen, posteriorly the sacrum and coccyx, and on either side the converging ischial planes culminating in the ischial spines. These projections, encroaching, as they manifestly do, on certain measurements of the lower parts of the pelvis, have, as will be explained afterwards, a very important bearing upon the mechanical laws which govern the process of parturition.

Fig. 10.

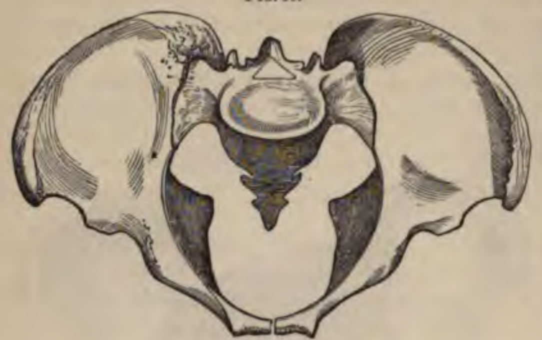
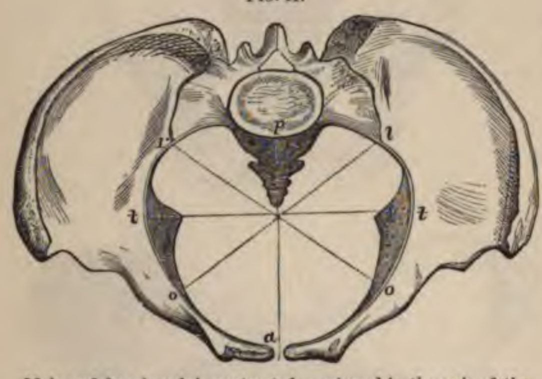


Fig. 11.



Male and female pelvis contrasted, as viewed in the axis of the brim.

If, again, we look at the bony outlet, we find here also three projections, posteriorly the sacrum and coccyx, and at the sides the ischial tuberosities. Between the latter is the subpubic angle, while between them and the sacrum on each side is the irregular sacro-sciatic gap, partly closed, as we shall see presently, by powerful ligamentous structures, and much more spacious in the female than in the male.[1] These, the main features which enable us to distinguish between the male and female pelvis, having now been noticed, we shall advert in future to the female pelvis alone.

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[1] The greater expansion of the ilia, and divergence of the cotyloid cavities, give the chief peculiarities to the female figure, in regard to which the ancient Greek sculptors are probably not far from the truth in representing their ideal of female beauty as measuring a third more across the hips than the shoulders, while these measurements are reversed in the case of Apollo. The same peculiarity occasions the peculiar swinging gait, which is the more marked in a woman the broader the pelvis is in proportion to her height.

The ligaments and articulations which bind the various parts of the pelvis together may now be briefly noticed.

a. Pelvi-lumbar Articulation.—In addition to the intervertebral disk, and the ligaments which are strictly analogous to those existing between the vertebræ above, attention must here be paid to the *sacro-vertebral* and *ilio-lumbar* ligaments. The former passes, expanding as it descends, obliquely from the tip of the transverse process of the last lumbar vertebra, to the depressed lateral part of the base of the sacrum; the latter horizontally between the tip of the transverse process of the last lumbar vertebra and the posterior margin of the iliac fossa, where it somewhat expands.

b. Sacro-coccygeal Articulation.—An anterior and posterior ligament and intervertebral disks are here found as in the more perfect vertebræ. There is observed besides in women, and in a lesser degree in the male sex, a synovial membrane which has been described by Cruveilhier, and which converts this into a perfect hinge-joint, the structure and mobility of which become, as has already been mentioned, much more obvious in the latter stage of pregnancy.

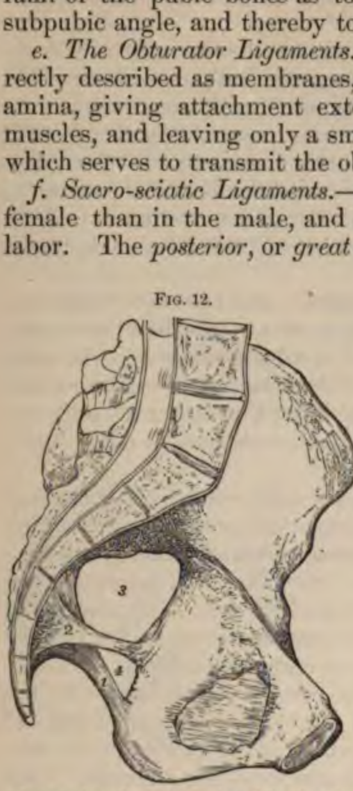
c. Sacro-iliac Articulation.—The bones are here joined by a twofold union; in the first place, by the cartilaginous auricular surfaces which are seen anteriorly when the parts are forced asunder, and from which the name *synchondrosis* is often given to the joint. Generally, these surfaces are closely united; but in pregnant women, and, probably, under certain other circumstances, an indistinct synovial cavity may be demonstrated, admitting, as there is every reason to believe, of a certain amount of motion. This union is greatly strengthened by the posterior sacro-iliac ligaments, consisting of strong irregular bands of fibres which pass from the overhanging portion of the ilium to the contiguous rugged projections on the lateral surface of the sacrum. One of these bands, extending downwards from the posterior superior iliac spine, to the third or fourth piece of the sacrum, in a direction different from the other fibres, is known under the name of the oblique sacro-iliac ligament. An anterior sacro-iliac ligament is also described, but it is of little anatomical importance.

d. The Symphysis Pubis.—This joint is, like the previous one, also effected by fibro-cartilaginous plates and ligaments. The two cartilages are thicker in front where they come into contact with each other, and thinner posteriorly, so as to leave a space which is, as in the other joints just described, lined by a synovial membrane. During pregnancy, an effect is produced upon this joint precisely similar to what has been stated to occur in the sacro-iliac joints, but it is in this case even more marked. The articulation is materially strengthened by the ligaments which surround it, named respectively posterior, superior, anterior, and inferior pubic ligaments. Of these, the posterior is a layer of fibres of little strength; the superior is connected with a band of fibres which arises from the spine of the pubis, and conceals the irregularities of the crest of the same bone; the anterior is a layer of irregular fibres passing across from one side to the other, and crossing obliquely the corresponding fibres from the other side, and the inferior, triangular, or subpubic ligament is so thick, and so formed by its attachments to the rami of the pubic bones as to give smoothness and roundness to the subpubic angle, and thereby to facilitate the passage of the fœtus.

e. The Obturator Ligaments.—These structures, which are more correctly described as membranes, close almost entirely the obturator foramina, giving attachment externally and internally to the obturator muscles, and leaving only a small aperture in its upper and outer part, which serves to transmit the obturator vessels and nerve.

f. Sacro-sciatic Ligaments.—These are two in number, longer in the female than in the male, and become, to some extent, relaxed during labor. The *posterior*, or *great* sacro-sciatic ligament (Fig. 12, 1), which is placed in the inferior and posterior part of the pelvis, is broad and triangular in shape, and extends from the inner surface of the ischial tuberosity, which is the apex of the triangle, to the side of the coccyx and sacrum, as far as the posterior inferior spine of the ilium. This extensive attachment constitutes the base. The fibres of the apex expand, so as to send a falciform process upwards and forwards, along the margin of the ischial ramus, to join the fibres of the obturator fascia. 2, is the *anterior* or *small* sacro-sciatic ligament, which is both shorter and thinner than the other, and is also of a somewhat triangular shape. Its fibres are directed forwards and outwards; the fibres constituting its base are blended with those of the larger ligament; and its apex is attached to the spine of the ischium. By means of these structures, which are ossified in some of the lower animals, it will be observed that the sacro-sciatic notches are converted into foramina, *great* and *small sacro-sciatic;* 3 and 4. Through the former of these, the pyriform muscle, the great sciatic nerve, and the ischiatic vessels and nerves pass, while the latter admits of the exit from the pelvis of the obturator internus muscle and the pudic vessels and nerve.

FIG. 12.



Internal surface of female pelvis, showing —1, 2, greater and lesser sacro-sciatic ligaments; 3, 4, greater and lesser gaps or foramina.

The obstetrician may look upon these ligaments as discharging a double function. They act, as has already been mentioned, by preventing the displacement of the apex of the sacrum upwards and backwards,—an accident which, without their aid, the very oblique position of that bone would in the erect posture be likely to engender; and therefore, in this sense, they strengthen the sacro-iliac articulation. But, in addition to this, they close in, in some measure, the large irregular opening which constitutes the outlet of the pelvis; forming at the same time, the framework of those soft structures which constitute the *floor* of the pelvis—which exercise a very important influence on the progress of labor, and which act also by affording an efficient and elastic support to organs which would otherwise be liable to frequent displacement downwards.

In addition to the ligaments above described, there are others, some of them—as those of the hip-joint—of great importance; but as they have no special obstetrical interest, their description may here well be omitted.

Inclination of the Pelvis.—If we place the articulated pelvis on a table, so as to bring the tip of the coccyx and the ischial tuberosities into the same horizontal plane, the brim of the pelvis will be found to look upwards and slightly forwards. This was at one time supposed to be the actual position in the erect posture; and many persons now living may remember to have seen articulated skeletons in which the pelvis was so placed. Hence the term "horizontal," which use and wont has attached to the upper of the two rami of the pubis. Nägele was the first clearly to show, not only that this was an error, but that it was a very gross one,[1] and that the pelvis was, in the normal position, inclined forwards to such an extent that the plane of the brim met the horizon at an angle of 60° or more (Fig. 13, *a*). The same observer, after examining a large number of well-formed female bodies, concluded, further, that the average height of the promontory of the sacrum above the upper margin of the symphysis pubis is about 3¾ inches, and that a line drawn from the tip of the coccyx to the lowest part of the symphysis, formed with the horizon at *b* an angle which varies greatly, but which may be stated, as an average, at about 11°. In reference to this, however, it must be borne in mind, that the recession of the coccyx implies a movement downwards as well as backwards, and that, consequently, this angle will be rendered still more acute during the passage of the child. The axis of the brim of the pelvis, then, is a line, *c d*, which passes upwards and strongly forwards, while that of the bony outlet is directed downwards and slightly backwards. The axis of the cavity is usually described as the perpendicular of a line drawn from the middle of the symphysis pubis to the centre of the sacro-coccygeal curve.

FIG. 13.

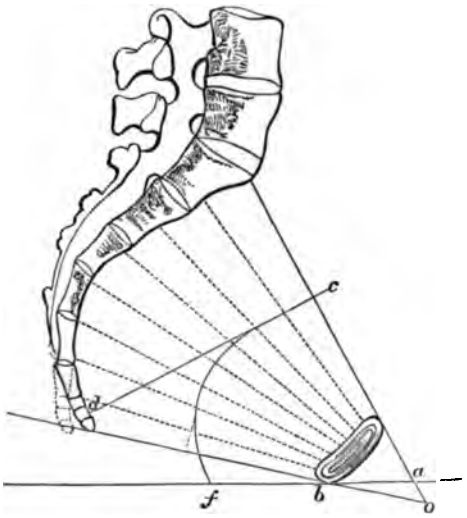


Diagram showing the inclination and axis of the true pelvis.

Axis of the True Pelvis.—If the bony pelvis were a simple cylinder,

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[1] "Das Weibliche Becken," &c. Carlsruhe. 1825.

the demonstration of its axis would be a very simple matter. All that would then be necessary would be to make a section, perpendicular to its walls, when the axis of the cavity would be shown to be a line intersecting the plane represented by this section, and equidistant from every part of the cylinder wall. The same simplicity of description will not, however, suffice in the case of the irregular and curved pelvic cylinder. What is known as the "curve of Carus," was at one time generally supposed to represent the axis of the pelvis. This curve is described in the following manner. The compasses are opened to the extent of 2½ inches: one point is placed upon the central point of the posterior surface of the symphysis, while with the other a curve is drawn from the plane of the brim to the plane of the outlet, the segment of the circle thus indicated being assumed to represent the axis of the pelvis. A mere superficial observation of the human pelvis will serve to show that neither this nor the segment of any circle can truly, or even approximately, represent the axis in question.

Although not absolutely free from technical objection, we may assume that the following more modern view brings us much nearer the truth. If we produce the lines in the above diagram which represent the planes of the brim and outlet, to their point of intersection in front of the symphysis at *o*, and from this common centre draw an infinite number of radii passing through the pelvic cavity, each of these radii may be held to represent the plane of that portion of the cavity through which it passes. If we then draw a line which shall pass through the geometrical centre of each of these planes, that line will be found to be a curve, which coincides very closely with the axis of the true pelvis, which is the segment of no circle, and which has been well described as an irregular parabola. One point must here, however, be noted,—that as the terminal planes or radii will be modified by the motion of the coccyx during labor, so in like manner will the inferior portion of the curve be proportionally altered. This is indicated in the diagram, where the line *c f* marks the parabolic curve or assumed true pelvic axis.

FIG. 14.

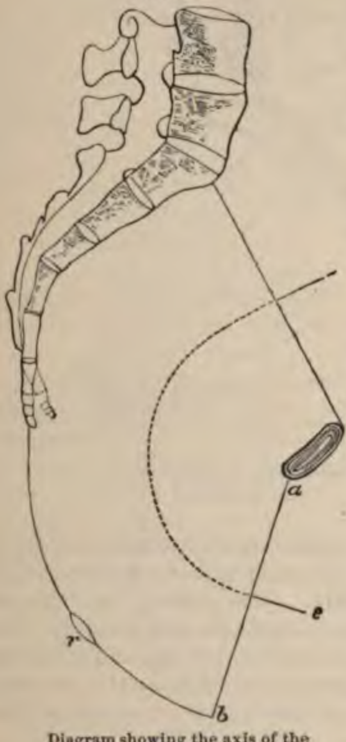

Diagram showing the axis of the parturient canal.

We must here be careful in drawing a distinction between the axis of the outlet of the bony pelvis, and that axis which represents the direction in which the child is born. In considering the latter, it is essential that the soft parts forming the floor of the pelvis should be looked upon as constituting the posterior and inferior boundary of a continuation of the pelvic canal. These parts, which extend from the tip of the coccyx to the posterior commissure of the vagina, are subjected during delivery to an amount of stretching for which nature makes due provision. The sphincter of the anus is dragged asunder, the perineum distends in all directions in a manner apparently incompatible with the integrity of that structure, until ultimately, at the moment of expulsion, the fourchette is driven downwards and carried forwards to such an extent, that a line drawn from the subpubic angle to the edge of the distended perineum, shows the plane of the outlet of the completed pelvic canal to look not downwards, but almost directly forwards (Fig. 14, *a b*). The line *e* perpendicular to, and meeting the centre of the plane, is then the *axis of expulsion*. The tendency of that part of the child which is first born, is to move upwards and forwards under the pubic arch, and in front of the symphysis, in continuation of the curve indicated in the diagram by dotted lines.

Let us now look more closely at the various parts of this tube which attract special notice, viz., the Brim, the Cavity, and the Outlet. The Brim presents (Fig. 11, p. 38) an irregular oval appearance, the long diameter of the oval being from side to side. It has been found on an average to measure in the *antero-posterior* or *conjugate* diameter, *a p*, which is taken from the promontory of the sacrum to the upper edge of the symphysis pubis, 4½ inches. Its greatest *transverse* measurement, *t t*, is 5¼ inches. In addition to these, there is also described an *oblique* diameter, extending from the sacro-iliac synchondrosis on each side to a point near the ilio-pectineal eminence on the other. This measures 5 inches, and it must be remembered that these diameters take their name "right" (*r o*), or "left" (*l o*), *oblique according to the sacro-iliac synchondrosis from which they spring.*[1]

It will thus be observed that, in the skeleton, the transverse is the longest diameter of the three, but, when the soft parts are *in situ*, this is no longer the case, as the iliacus muscle overlaps the brim so as to diminish the transverse while it scarcely encroaches upon the oblique diameter. The effect of this is that the oblique is now the longest diameter, a fact which we find of great interest and importance when we study the relation of those parts to the fœtal head.

The Cavity of the pelvis is the whole tube between the brim and the outlet. As a general rule, the deeper the cavity the more difficult is the labor, for in this case the pelvis approximates in its formation to the male type. If the diameters are proportionally enlarged, labor may be, it is true, quite easy; but the rule undoubtedly is, that in the case of the tall handsome woman with dignified gait and carriage, the probability of a difficult labor is much greater than in the short wide-hipped woman, in whom the swinging, or (to put it less gallantly) the waddling motion of her sex is more obvious. The cavity, as a single glance will show (Fig. 15), is deep posteriorly and shallow anteriorly. The average depth of the symphysis pubis gives the anterior depth at 1½ inches. The height of the planes of the ischia which corresponds to the middle depth may be stated as about 3½ inches. The depth posteriorly may be set down, if we measure directly from the promontory of the sacrum to the tip of the coccyx, as 4¼ inches, which, if we follow the curve of the sacrum, will be increased to about 5½ inches, the former of these measurements making no allowance, however, for the yielding of the coccyx. Three diameters are also taken in the case of the cavity as representing its width: the *conjugate*, from the centre of the symphysis pubis to the centre of the hollow of the sacrum, 5¼ inches; the *transverse*, from a point corresponding to the lower margin of the acetabulum on one side to the corresponding point on the other, 5 inches; and the *oblique*, from the centre of the great sacro-sciatic foramen on one side to the foramen ovale on the other, 5¼ inches.

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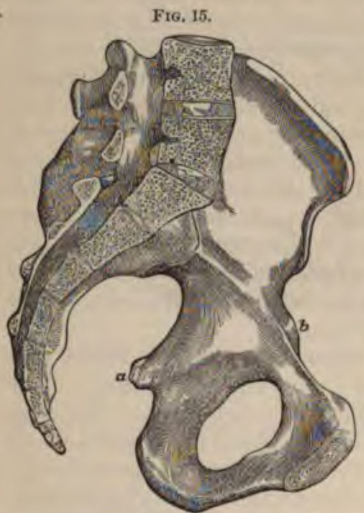
[1] In regard to this there unfortunately exists some discrepancy. The diameters are named "right" and "left" as in the text by the best English and German writers, but some eminent French and American authors have named them from the cotyloid cavity, thus inverting the meaning of the terms.

FIG. 15.



Interior of pelvis, showing the ischial planes.

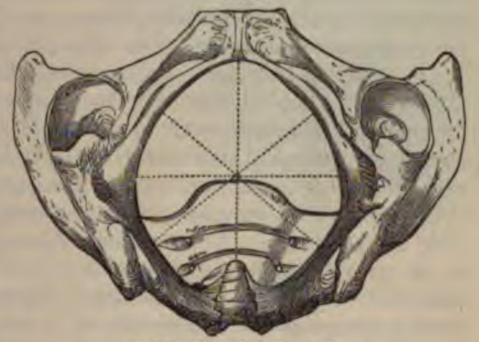
Looking now at the internal surface of the pelvic canal in a section, such as is here shown, we may observe that the lateral wall is divided into two parts by a not very obvious line of demarcation (*a*, *b*), leading downwards and backwards from the ileo-pectineal eminence to the spine of the ischium. That part of the ischium which is in front of this looks slightly forwards, that which is behind slightly backwards. These are the *anterior* and *posterior inclined planes* of the ischium, supposed by Désormeaux, Tyler Smith, and many others, to determine the rotation of the head in the mechanism of parturition. To this, however, we shall return.

While the brim or inlet of the pelvis is directed, as we have seen, upwards and forwards in the erect posture, that of the outlet, owing to the curve formed by the axis of the cavity, looks backwards, and, when the coccyx is extended, almost directly downwards.

The *conjugate* diameter of the outlet (Fig. 16) extends from the lower margin of the symphysis pubis to the tip of the coccyx, and may be set down as 5 inches. In many cases the measurement is much less than this, and in any case the diameter may be increased to the extent of an inch, or even more, by the mobility of the coccyx during labor. The *transverse*, from one tuber ischii to the other, is about 4¾ inches; and the *oblique*, from the middle of the lower edge of the great sacro-sciatic ligament on one side to the point of union between the ischium and pubis on the other, also 4¾ inches.

The facts which are brought out by those figures are chiefly these: (*a*.) That the transverse measurement of the pelvic tube becomes progressively diminished from above downwards, being greatest at the brim and smallest at the outlet. This is due, as a single glance downwards in the axis of the brim will show, to the gradual approximation of the ischia (Fig. 11). (*b*.) That the conjugate diameter is, on the contrary, increased from above downwards, in consequence of the recession or curve of the sacrum, progressively from brim to outlet, if we allow for the bending back of the coccyx. These facts, which are associated with a remarkable rotation which the child undergoes during labor, are more clearly shown when, as in the following table, the figures above noted are brought into juxtaposition. Along with these, a few of the more important of the many measurements which have been made of the female pelvis are also set down in inches.

FIG. 16.



Outlet of the female pelvis.

1.	Circumferential measurement of the Brim, ...	17
2.	Measurement from the promontory of the Sacrum to the centre of the Cotyloid Cavity (Sacro-cotyloid), . .	3¼
3.	Between widest part of Iliac Crests, ...	10¾
4.	" Anterior superior Spines of Ilium, ...	10¼
5.	" Front of Symphysis and Sacral Spines, . . .	7

6. *True Pelvis.*	Conjugate.	Transverse.	Oblique.
Brim, ...	4½	5¼	5
Cavity, ...	5¼	5	[5¼][1]
Outlet, ...	[2]5	4¼	[4¾]

All the measurements given in this table are, it must be remembered, those of the skeleton—no allowance being in any case made for the soft parts. The encroachment of the psoas and iliacus muscles and fascia reduce the transverse diameter of the brim by about half an inch, while the other diameters of the brim, as well as of the cavity and outlet, are only reduced by an eighth to a quarter of an inch at the most. The oblique diameters are least of all affected, but, owing to the presence of the rectum on the left side, the *left* oblique diameter is slightly shorter than the right. These facts have to be borne in mind in the course of examinations which are made with a view of estimating the capacity of the pelvis in its various parts,—a question often of vital import in the practice of Midwifery; and in such investigations it is also useful to know that the distance from the *lower edge* of the symphysis to the promontory of the sacrum is about half an inch more than the conjugate of the brim. In regard to the measurements numbered 3, 4, and 5 in the table, if these are to be estimated by measurements in the living body, from two to three inches must be added for the tegumentary and other external structures.

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[1] The oblique diameters of the cavity and outlet are placed in brackets, as, not being taken from fixed bony points, they are of comparatively little importance.

[2] 6 when coccyx forced back.

In addition to those angles which have already been described as formed with the horizon by the planes of the brim and outlet, and measuring respectively 60° and 11° (Fig. 13), and the subpubic angle, there are several others which should not be overlooked. *The sacro-vertebral angle* is that which the sacrum forms with the upper portion of the vertebral column, and is estimated as 117° in the male, and 130° in the female. This remarkable contrast serves to show that there is no gain whatever in *capacity* by a sudden recession of the sacrum, and that they who have assumed that in the female there is a more abrupt recession of the sacrum, are as much in error as those who have described the female sacrum to be more curved than the male. The symphysis forms with the horizon an angle of 35° to 40° in the erect posture; while the ischium forms with the ilium, or rather with the imaginary line leading downwards and forwards, and representing the mean direction of that bone, an angle of 110° to 115°. This latter is called the *ilio-ischial angle.*[1]

Development of the Pelvis.—From birth to the age of puberty, the pelvis differs in many respects, besides mere size and state of ossification, from the same part in the adult. At birth, the iliac fossæ are flat, and have their surfaces directed more forwards. The pubis is very short. The sacrum is very narrow, and on this account the transverse measurements are relatively smaller than the conjugate, while all the diameters are extremely small, and so insufficient for the reception of what are known as pelvic organs, that these parts are for the most part lodged in the abdominal cavity. This contributes, no doubt, to the abdominal prominence which is so familiar in the newly born. The sacrum is very flat, and there is also very little approximation of the inner surfaces of the ischium, which gives to the sides of the pelvis a general appearance of parallelism not existing in the adult. A very general idea prevails among the best modern writers that the inclination of the brim is considerably increased as compared with the adult. This has been stated by Cruveilhier and Burns, and even more decidedly by Cazeaux. "The sacrum," says the latter, "is so flat and so elevated, that a horizontal line drawn from the upper part of the pubis will pass below the coccyx." Mr. Wood, however, has given the weight of his authority in favor of another view, and states it as the result of his careful observations, made by sections when the soft parts were *in situ*, that he has always found the tip of the coccyx "as low as the *lower* border of the symphysis pubis." Such a serious discrepancy can only be accounted for by supposing that a different mode of observation has been adopted.

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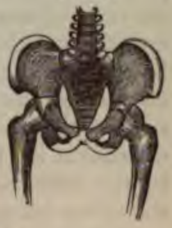
[1] For a complete and exhaustive demonstration of these and other points alluded to, see Mr. Wood's Essay, Art. "Pelvis," in Todd's Cyclopædia.

The child, it must be remembered, is not as yet structurally fit for the erect position, and therefore maintains for many months after birth a posture similar to that which it assumes in the womb, with the thighs flexed upon the abdomen, and the symphysis tilted upwards. To measure the pelvic angles of the child, with the view of comparing them with those of the adult, it is essential that the child should be placed in such a position as may, without violence or rupture of tissue, coincide as nearly as possible with the erect posture, and if this is done the pelvis will usually be found to present the appearance shown in Fig. 17. From this point of view Cazeaux is possibly correct; but if a section be made through a child in the position which it instinctively adopts, the relative position of parts, as described and figured by Mr. Wood, will probably under these circumstances be confirmed. The other distinctive characteristics of the infant pelvis are also shown in the figure, in which, moreover, the general resemblance to the type of the Simiina may afford some pleasing suggestions to the disciples of Darwin.

FIG. 17.



According to Burns, it is not until the tenth year that the transverse comes to exceed the conjugate measurement. There is, however, nothing which would enable us to distinguish with even an approach to certainty between the male and female pelvis until the period of puberty approaches, when nature, availing herself of the plastic nature of these bones due to their tardy ossification, moulds the parts in full view of the important physiological function which is about to be instituted, so that the marked characteristic features of the female pelvis are now rapidly developed.

Hitherto we have looked at the pelvis as an osseous and ligamentous structure only. Connected in the most intimate manner with it, however, there are certain soft structures which cannot properly be included in a description of the organs of generation, and which fall therefore to be considered in this place. The fanshaped *iliacus* muscle forms along with the *psoas* on each side a sort of cushion, which, besides giving proper support to other viscera, forms a rest for the gravid uterus and an effectual protection for it against shock. It encroaches, as we have seen, upon the transverse without materially lessening the oblique diameter, and this encroachment is more marked when the muscles are in a state of contraction. On each side of the cavity, there are two muscles covering in to a great extent the great sciatic and obturator gaps. These are the *pyriformis* and *obturator internus* muscles, to the contraction of which the rotation of the fœtal head which takes place within the cavity was supposed by Flamand of Strasbourg to be due. The dimensions of the cavity are further reduced by the rectum and bladder, and by the cellular tissue which, when overcharged with fat, may form a barrier to the progress of labor, rendering its course more tedious.

The perineal strait, open in the skeleton, is occupied by firm contractile tissues, which form a floor for the support of the pelvic, and, indirectly, of the abdominal viscera. This floor is formed of two muscular layers. Of these, the internal layer, which is formed by the *levator* *ani* and *coccygeus*, has its concavity directed upwards, and has been named, not inappropriately, by Meyer the "pelvic diaphragm." The external layer, with its concavity downwards, is formed of the muscles of the perineum, known to anatomists as the *sphincter ani*, *transversus perinei*, *ischio-cavernosus*, and *sphincter vaginæ*. The pudic vessels and nerves, cellular tissue, the pelvic aponeurosis, an intermuscular aponeurosis, and the skin, complete this floor, which at the time of delivery becomes thin and distends to a very considerable extent. In the ordinary state, the measurement from the coccyx to the posterior commissure of the vulva is a little more than 3 inches; but during labor the distension is such that it is increased to 5, 6, 6½ inches, or even more, by the stretching of the parts, and by overcoming the contraction of the sphincter ani.

Mammary Glands.—Intimately associated with the function of the reproductive system are the glands, the presence of which serve to distinguish the class Mammalia. On this account, several modern writers have, with perfect propriety, included these organs in a description of the external parts of generation. When they are fully developed in a woman, they extend from the third to the sixth or seventh rib, and from the side of the sternum to the axilla, the left breast being generally the larger of the two. The nipple (*mammilla*) projects about the level of the fourth rib from near the centre of the gland, and is, in the virgin, of a rose-pink color. It is surrounded by a ring of similar hue (*areola*), varying in tint with the complexion of the individual. On the surface of this, several small tubercular projections are visible, on each of which are the orifices of several glands.[1] The tissue of the nipple is very rich in bloodvessels, and contains muscular fibres of the non-striated variety with a certain amount of erectile tissue, the surface being covered with papillæ, which are highly sensitive. The turgescence of the nipple, which occurs under irritation, is usually attended with a pleasurable sensation.

The bulk of the breasts, and what gives to them their smooth and moulded form, is chiefly fat, which, except at the nipple and areola, where the gland is contiguous to the surface, lies beneath the skin, and dips down into the intervals between the lobes and lobules of which the gland is composed. Each of these lobes is inclosed in a distinct cavity (*loculus*, Fig. 18, *a*), has a separate excretory duct, and is subdivided again and again into smaller lobes, and ultimately into terminal lobules. Within the latter, by a process of cell development, and multiplication of nuclei, the milk is eliminated from the surrounding vessels. The fluid, on the rupture of the cells, passes into the terminal ramifications of the ducts, which by their junction form larger canals termed *galactopherous ducts*. The milk being thus brought from the various lobes, these ducts, from fifteen to twenty in number, converge towards the areola, beneath which they become considerably dilated into sinuses, *c*, which serve as temporary reservoirs for the milk against the period of suckling. Between this and the nipple the ducts again become contracted, 5, and proceed from the base of the nipple towards its summit without communicating, each discharging its contents by a special orifice. The walls of the tubes and sinuses are composed of areolar tissue, with longitudinal and circular elastic filaments. Irritation of the nipple, either by the contact of the child or otherwise, causes a dilatation of these openings, and at the same time a contraction of the walls of the sinuses, which may be looked upon as a reflex action, and which causes the milk to flow abundantly. Not unfrequently, a spasmodic contraction takes place independently of any special excitement, the result being the involuntary expulsion and loss of the milk. The well-known sympathy which subsists between the glands and other organs, such as the stomach and uterus, may give rise to similar phenomena; while that which exists between the breasts of each side often results in the spasmodic emptying of one gland while the child is at the other.

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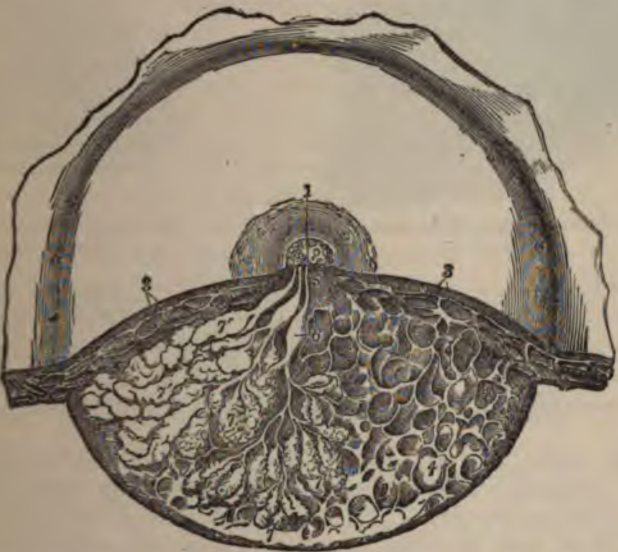
[1] These appearances are materially altered after impregnation. See *Signs of Pregnancy*.

FIG. 18.



The lacteal vessels are lined throughout by a mucous membrane continuous at the nipple with the common integument, and which is invested by a tessellated epithelium. They are accompanied in their whole course by numerous lymphatics, which are connected intimately with those of the axilla and other neighboring parts. These lymphatics are believed to take up the watery portion of the milk, and it is supposed to be by their action that frictions are beneficial in cases where we wish to diminish or arrest the secretion of milk. They receive their blood from the internal mammary, axillary, and intercostal arteries. The veins form round the nipple a circle or plexus, which is usually called the *circulus venosus* of Haller. In the latter months of pregnancy, the pressure of the gravid uterus tends, as Mr. Nunn has pointed out, to increase from mechanical causes the quantity of blood in these vessels, and thus to promote the secretion of the gland.

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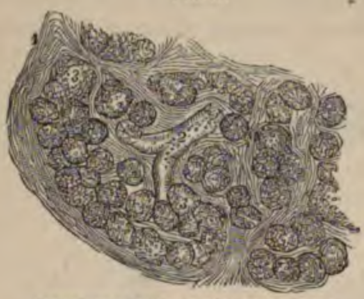
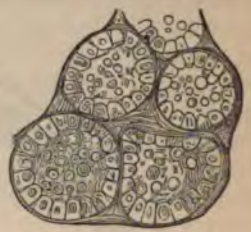
Fig. 19, from Henle, represents a section from a small lobule of the gland, magnified 60 diameters. 1, shows the stroma of the connective tissue which supports the glandular structure; 2, terminal ramuscule of one of the gland tubes; 3, glandular vesicles. Fig. 20 shows several of the glandular vesicles, magnified much more highly, about 200 diameters. The secreting epithelial cells which line the vesicles are here represented, while the cavities contain a certain number of milk-globules.

Fig. 19.



Structure of a lobule of the mammary gland.

Fig. 20.



Ultimate glandular vesicles of the mamma.

In the male, the mammary gland exists, but is rudimentary. Various anomalies in structure have been met with, such as two or three nipples on one gland, or an additional mamma or even mammæ. In the latter case, the supernumerary glands are usually near their ordinary site, but sometimes they have been found in a distant part of the body—as the axilla, thigh, or back.

CHAPTER III.

FEMALE ORGANS OF GENERATION.

A. EXTERNAL. LABIA; PERINEUM; HYMEN, ETC.—ERECTILE TISSUE—THE VAGINA—GLANDS OF THE EXTERNAL ORGANS—ABNORMAL CONDITIONS.

B. INTERNAL. THE UTERUS: SITUATION OF; DIVIDED INTO BODY AND CERVIX; AXIS OF UNIMPREGNATED UTERUS; CAVITY OF; FUNDUS; SURFACES AND BORDERS—SEROUS COVERING OF—BROAD LIGAMENTS; ROUND LIGAMENTS; VESICO-UTERINE FOLDS—THE FALLOPIAN TUBES—PAROVARIUM—FOLDS OF DOUGLAS—EQUILIBRIUM OF THE UTERUS MAINTAINED.

THE Organs of Generation in the female include,—besides the uterus, ovaries, and other parts situated internally,—the Vagina, Vulva, and Mons Veneris. These latter being, more properly, external organs, anatomists have divided the whole into *External* and *Internal* Organs.

External Organs of Generation.—Immediately over the symphysis pubis, above and in front of the opening of the *vulva* or *pudendum*, is a firm cushion-like eminence, about two inches in depth and three inches transversely. This, which is called the *Mons Veneris*, varies in prominence according to the conformation of the pubes, and the amount of adipose and cellular tissue in it and the contiguous parts. After puberty, it is covered with hair, and is abundantly furnished with sebaceous follicles, which were supposed by Moreau to contribute in some measure to the dilatation of the external parts at the moment of delivery. Continuous with this structure, extending downwards and backwards, and becoming gradually thinner in their course, are two rounded folds of integument, which, diverging from each other, leave in the median line an elliptical interval between them. These are named the *labia majora, labia externa*, or *labia pudendi.* They present an external surface, which is lined with skin similar to that of the mons veneris, and an internal surface covered with mucous membrane, which is the commencement of the genito-urinary tract. Behind, the thinner margins unite, forming the posterior commissure of the vagina. The *fourchette*, or *frœnulum pudendi*, is a transverse fold in front of this, which resembles and has been aptly compared to the continuation of the skin at the roots of the fingers, and is very generally torn in first labors. The depression between the fourchette and the commissure has been called the *fossa navicularis.* Between the skin and superficial fascia of the labia there exists a purse-shaped sac, which has been described by M. Broca as analogous to the dartos tunic of the scrotum. This sac is filled with fat and cellular tissue, is the receptacle occasionally of hernia, and to it have been traced the terminal fibres of the round ligament of the uterus.

The *perineum* extends from the posterior commissure to the anus, and is usually about an inch and a half in length. It is made up of highly distensible cellular tissue, and has been said to contain some yellow elastic tissue. It is susceptible of great distension during labor, without, under ordinary circumstances, any risk of rupture.

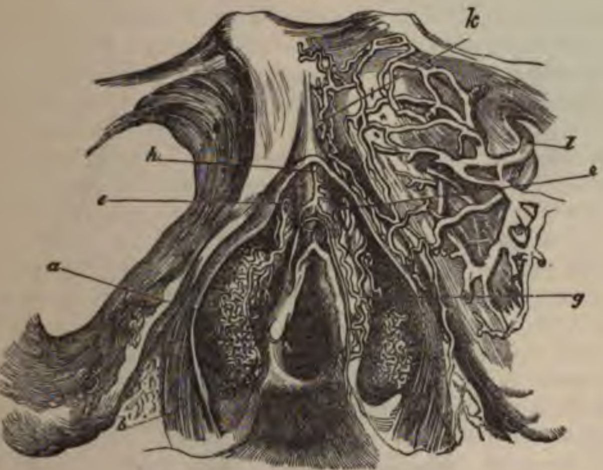
On separating the labia majora, the *labia minora* or *nymphœ* are brought into view. These are two thick mucous folds, somewhat resembling the comb of a cock, about an inch and a half in length, having their origin on the inner surface of the labia majora, and becoming wider as they pass upwards and forwards, converging towards the clitoris, with the prepuce of which they are continuous. The *clitoris* is a small erectile tubercle, situated somewhat above the level of the lower margin of the symphysis pubis. Like the penis of the male, it has a suspensory ligament, two crura, two corpora cavernosa, and a glans, but has no corpus spongiosum nor urethra. Two muscles, corresponding to the ischio-cavernous, are in the female called "erectores clitoridis." The *vestibule* is a small triangular space, bounded above by the clitoris, below by the urethra, and on either side by the diverging nymphæ. It is about an inch in length, is smooth on the surface, and is specially important as a guide to the finger of the accoucheur in the introduction of the catheter—an operation which should always be performed, if possible, without exposing the patient. The *meatus* *urinarius* is indicated by a small projection, easily discovered by the finger, immediately beneath the vestibule, and in front of the vaginal entrance. The catheter being laid along the palmar surface of the fore finger, its point is guided towards the projection just mentioned, when, if the other extremity is gently depressed, it will usually pass in without the slightest difficulty. When the parts are distorted by disease, or by the tumefaction which occurs after labor, it is often necessary to expose the patient before the instrument can be introduced. The *urethra* is about one inch to one inch and a half in length, highly distensible, and, in the unimpregnated state, almost straight. In young children, what may be called the urinary parts of the vulva are prominent, and it is not till the approach of puberty that the genital portion is observed to predominate.

Behind and beneath the meatus, is the orifice of the Vagina, varying greatly in appearance and in dimensions in young girls, in those who are no longer virgins, and in those who have borne children. In virgins, it is generally closed to a considerable extent by a thin fold of the mucous membrane called the *hymen*, which was at one time supposed to be the "seal of virginity," but which may be ruptured by many causes other than coitus. Its usual form is crescentic, with the concavity upwards, closing in the posterior, and to some extent the lateral portions of the opening; but it may present itself under various other forms. It has been frequently observed, for example, to be circular, with a small perforation in the centre; or cribriform, with several perforations, as in a medico-legal case which the writer was called upon to examine; or infundibuliform; or offering rarer peculiarities. In some instances, the closure is complete. But, whether complete or partial, or under what form soever it may present itself, the first effects of coitus are generally sufficient to rupture this fragile partition. In rare cases, however, its texture is so firm and resistant, that penetration is rendered impossible until the structure has been divided by the scalpel; and in cases of complete closure, where there is no question of coition, the operation may be necessitated from its being a barrier to the menstrual flow.

When the hymen is absent, small projections, supposed to resemble myrtle-berries, and hence called *carunculæ myrtiformes*, generally about three or four on each side, are noticed on the margins of the opening. These were generally supposed to be the remnants of the ruptured hymen, but, as they have been found to exist along with the hymen, this must be looked upon as open to doubt.

Bloodvessels are supplied in abundance to all parts of the external generative organs, and in certain situations the masses of venous plexuses which are termed *erectile tissue* are found in considerable quantity. The accompanying cut, from Kobelt, shows these structures carefully dissected. Besides the erectile parts already mentioned, there are, on either side of the vaginal orifice, two large leech-shaped masses, *a*, called *bulbi vestibuli*, which are about an inch in length, and are connected with the crura of the clitoris and the rami of the pubis, covered internally by the mucous membrane, and embraced on the outside by the fibres of the constrictor vaginæ muscle. A small plexus, the *pars* *intermedia* of Kobelt, has direct vascular connection with the bulbs. These erectile tissues receive their blood from the internal pudic arteries.

FIG. 21.

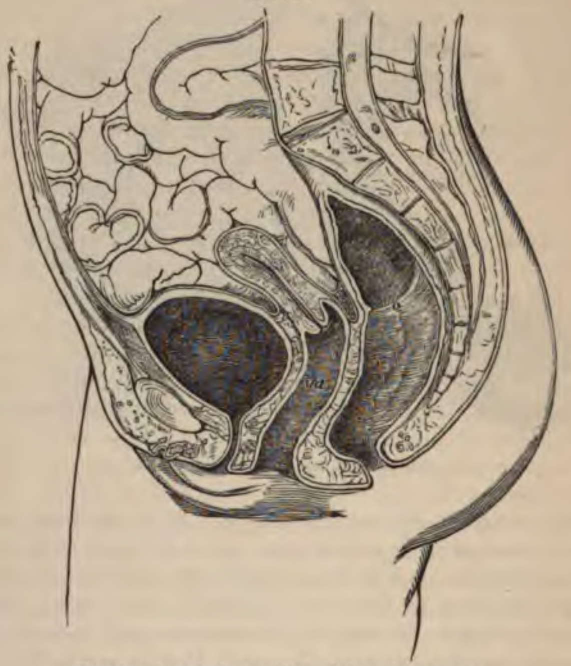


External organs, partially dissected.

The *Vagina* is a membranous and highly dilatable tube, which serves to connect the vulva with the uterus. It is situated in the true pelvis, between the bladder and rectum anteriorly and posteriorly, and the levatores ani muscles at the sides. Its axis is a curve, which corresponds in some degree to that of the pelvis; and, in consequence, its anterior is shorter than its posterior wall, the former being about four, and the latter five or six inches in length. It is narrowest at the vulva, where it is embraced by the constrictor vaginæ muscle, and widest at its middle part, where it is extended transversely, owing to its being compressed by the organs before and behind. The thickest part of the tube is its anterior wall, where it is intimately connected with the bladder, and with the urethra, which is, as it were, imbedded in it. Its connection with the levatores ani muscles and the rectum is much looser, which admits of easy dilatation, and which also accounts for the fact that the rectum is rarely dragged down in uterine displacements, while the bladder is, from its closer connection, almost invariably altered in its relations. In the upper part of its posterior surface, it is separated from the rectum by a double fold of serous membrane, which forms a pouch of the peritoneal cavity.

The external surface of the vagina is composed mainly of dense areolar tissue, beneath which there are two indistinct layers of muscular fibres of the unstriped variety, the external being disposed longitudinally, while the internal are circular in their direction. Around the tube, a layer of loose erectile tissue has been found, which is most distinct at the lower part. Internally, it is lined throughout by mucous membrane, which is covered with epithelium of the squamous variety, and is continuous in one direction with the skin and in the other with the mucous membrane of the uterus. Along the anterior and posterior walls, the membrane is slightly raised in the middle line, so as to form a ridge similar to the raphé in other parts. These ridges are called *columnæ rugarum;* and, at right angles to them, the membrane is thrown into numerous transverse folds (*rugæ*) which are always more distinct in those who have not borne children, and which are obviously destined to facilitate the dilatation of the parts.

Fig. 22.



Showing the relative position of the pelvic organs.

The upper part of the vagina embraces the neck of the uterus, which projects into the cavity from above, and in front. The vaginal mucous membrane is consequently reflected over the neck of the uterus some way above its mouth, the point of reflection being higher on the posterior wall; and it has been observed that the connection between the membranes and the subjacent uterine tissue is very firm close to the mouth of the womb, and is much less so as it approaches the point of reflection. This admits of the complete dilatation of the uterus, and the consequent obliteration of the neck. The other tissues of the vagina are continuous, or at least very closely united, with the corresponding tissues of the uterus. A reference to Fig. 22 will serve to show that the vagina terminates in a cul-de-sac above and behind the uterus, and that at this point its wall is for some distance in direct relation with the peritoneal cavity, a fact of no little practical importance. The cul-de-sac of peritoneum with which it is in contact is termed the *recto-vaginal pouch,* and sometimes the pouch of Douglas.

Further, the vagina may be considered as the organ of copulation in women; and, at the same time, the canal which is destined to transmit the menstrual discharge, and, in case of pregnancy, the product of conception. It is abundantly supplied with vessels and nerves. The blood-supply is derived from the vaginal and other branches of the internal iliac artery, and returns by means of corresponding veins, after forming at each side a vaginal plexus. The nerves have been traced to two sources, the hypogastric plexus of the sympathetic system, and the fourth sacral and pudic nerves of the spinal system.

The external organs of generation are furnished with numerous glands of various kinds, which have been very fully described by MM. Robert and Huguier. The latter divides the glands of the vulva and entrance of the vagina into sebaceous and muciparous follicles. The *sebaceous* variety is met with in great abundance over the whole of the parts from the genito-crural folds to the clitoris and nymphæ. Those of the nymphæ are exclusively sebaceous, and they all find their function in the secretion of an oily fluid, which maintains the elasticity, moisture, and sensibility of the parts, prevents them from adhering, and, above all, protects them from the irritating action of the urine. The *muciparous* follicles differ essentially in their situation, and in the nature of the fluid which they secrete. Although here and there they are isolated, as a general rule they are found in groups. One such group of eight or ten follicles is found imbedded in the mucous membrane of the vestibule. Another is observed in the immediate neighborhood of the meatus urinarius, their orifices being extremely minute, and opening for the most part below the aperture of the meatus, upon, or close to, the little tubercle already described. A third group is described as external to these, and situated on either side of the urethra; and a fourth, the orifices of which have been observed on each side of the vaginal opening, at the root of the hymen or carunculæ myrtiformes.

Under the muciparous class, two compound or conglomerate glands were long ago described by Bertholin, and more recently by anatomists under the name of the *vulvo-vaginal glands*. They are also called the glands of Duvernay, and are in many respects analogous to Cowper's glands in the male. They are about the size of a small bean, variable in form, and of a reddish-yellow color. Their development is said to proceed, *pari passu*, with that of the ovaries, reaching the maximum during the childbearing period, and being comparatively insignificant in youth and old age. They are situated one on each side, at the entrance of the vagina, beneath the superficial fascia, with their inner surface united to the vagina by areolar tissue, and the outer surface in relation with the constrictor muscle of the vagina. Each of the lobes of which the gland is composed gives origin to a little duct, all of which conduits ultimately unite at the internal and upper part, to form a common excretory duct, which proceeds horizontally forwards as far as the vaginal orifice, where it terminates within the nymphæ, and external to the hymen or carunculæ myrtiformes. The orifice is very small and valvular, and is often only to be discovered with difficulty, but its situation is usually indicated by an increased vascularity at the point whence it emerges. These glands secrete a fluid resembling that which is found in the prostate in the male, which is increased in quantity during coition, and is said to be expelled in jets, as occasionally occurs with the contents of the salivary duct. By lubricating the parts it facilitates coition, and by preserving their moisture probably tends to maintain their extreme sensibility.

The appearance and anatomical relations of the external organs of generation vary greatly according to age, and in consequence of venereal indulgence, or of childbearing. At birth, the nymphæ project beyond the level of the labia majora, and the parts in general look more forward than in the adult. When puberty approaches, hair appears on the pubes, the nymphæ disappear between the labia, and the parts look downwards, so that in the erect posture nothing can be seen from before except the mons veneris; whereas, in the child, the upper parts of the vulva are distinctly visible. The labia are symmetrical, thicker above than below, closely applied to each other, and of a fresh rose color on their mucous surfaces. Venereal indulgence, and still more, pregnancy and childbearing, modify, in a great measure, the appearances here described. The hymen is ruptured and replaced by the carunculæ myrtiformes. The labia lose their regularity, and become of a more dingy hue on their mucous surface. The nymphæ come again into view, partly by separation of the labia, and partly in consequence of hypertrophy of their tissue, while their vivid rose tint becomes replaced by a darker shade of color. In some cases the hypertrophy is very remarkable, and when so, is usually unequal on the two sides. This is said to be very common among Hottentot women, where the nymphæ often become enormously enlarged. In women who have borne children, the fourchette is usually ruptured, and the vaginal orifice remains large and irregular. The vagina again, which in virgins presents the appearances already described, may now lose, to a great extent, its rugæ; and the deepening of its color is by some supposed to be a not unimportant sign of pregnancy. In women of advanced age, the vagina becomes contracted, being again thrown into folds, and greatly diminished in calibre. Its orifice shares in the contraction, the nymphæ shrink, and the labia majora come once more into proximity, while the glandular, erectile, and other special tissues become atrophied. In a word, the characteristics of childhood are again in a great measure restored.

Abnormal conditions, constituting some form or other of congenital malformation, are occasionally met with in the external organs. The labia may be imperfect or rudimentary, preserving in this respect the fœtal condition of the parts; they may be developed on one side only; or they may present the appearance of several folds. In cases of deficiency of the lower part of the abdominal wall and of the bladder, along with separation of the symphysis pubis, the labia are imperfectly formed and set wider apart than usual. The posterior commissure of the vaginal orifice may be hypertrophied and pushed forwards so as to cover the aperture. The labia are, in some instances, adherent along the median line, to such an extent that an opening is left sufficient only for the passage of the urine. Induration and hypertrophy such as to constitute elephantiasis has also, although rarely, been noticed. Entire absence of the clitoris, unassociated with any other form of malformation, is very rare. It is sometimes so small that it can with difficulty be discovered, and in these cases it might be erroneously supposed to be absent; but it may be assumed that, unless other parts, such as the nymphæ, are absent, the clitoris is only rudimentary. This organ is much more frequently enlarged, generally, no doubt, as the result of disease, but sometimes it is a pure hypertrophy of the normal tissues, when it may approach the dimensions of the penis and constitute one of the so-called forms of hermaphroditism. An extreme development of the nymphæ—common, as we have seen, in certain races—may occasionally be met with as a peculiarity of structure, and cases are recorded where the nymphæ have been found increased to two or even three pairs.

The folds of which the hymen is composed, ordinarily thin and fragile, are occasionally developed to such an extent as to prevent sexual congress; while, in some cases, it completely closes the mouth of the vagina, preventing not only coition and impregnation, but also menstruation, and, for the latter reason, if not for the former, rendering an operation necessary—which is usually a very simple one. Another condition of these parts which may call for operative interference, is what has been called *vaginismus*, where there exists such spasmodic contraction as prevents proper sexual contact, dilatation with or without the use of the scalpel being in such cases often found necessary. Congenital absence of the vagina is by no means of very rare occurrence. In extreme cases, the whole organ is wanting—the vulva terminating abruptly at the point where the vagina, in the ordinary condition of parts, commences. In others, a portion of the tube exists, but ends in a cul-de-sac at some distance from the os uteri; while, in another class of cases, there is a narrow canal, sufficient only for the passage of the menstrual fluid. In many of these cases, free incision may be found necessary, in order, by giving egress to the menstrual discharge, to relieve the serious symptoms which arrest of that important function is apt to engender.

A vertical septum occasionally exists, constituting the phenomenon of double vagina, in which, if complete, there is a hymen to each tube. More frequently, however, the septum is incomplete—either commencing at the vulva and terminating so as to leave the tube single at its upper part, or, conversely, commencing at the upper part and stopping short of the mouth of the vagina. In the latter case, we would expect it to be associated with double uterus. Transverse membranous septa also exist as congenital malformations, but much more frequently as the result of inflammatory action, or of the accidents of previous labors.

Many of the conditions above detailed may give rise to serious impediments, either to delivery, to impregnation, or to the proper performance of the menstrual function, and, in consequence, delicate, and even dangerous operations may under such circumstances be required.

THE INTERNAL ORGANS OF GENERATION.—These are the Uterus, the Fallopian Tubes, the Ovaries, with various ligamentous and other structures intimately connected with them.

The *Uterus*, when unimpregnated, and at mature age, is situated deeply within the true pelvis, between the bladder and the rectum in front and behind, and intimately connected at its lower part, as we have already seen, with the vaginal wall. The function which it has to discharge, is to receive the product of conception after it has passed through the Fallopian tube, and to maintain it within its cavity until, upon its maturity, it is expelled. The usual comparison of it to a pear, flattened from before backwards, gives one a very correct idea of its form. It is a hollow organ, with remarkably thick walls; and is so placed in the centre of the pelvis, that its upper part looks upwards and forwards, and its lower or vaginal part downwards and backwards. It is generally assumed, as sufficiently correct for all practical purposes, that its axis corresponds with that of the pelvic brim, or, in other words, that its axis, if carried downwards, would pass at the same time backwards, and cut the horizon at an angle of 30°. We shall see presently, however, that this is incorrect.

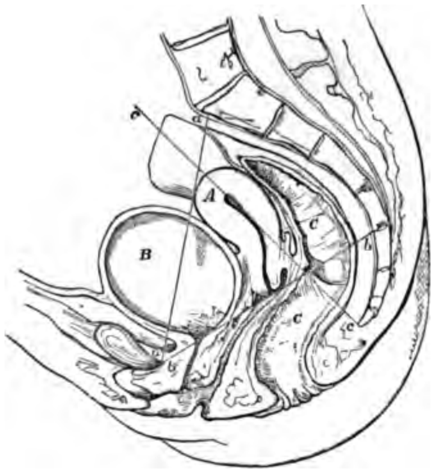
The uterus is divided into two parts; the *body*, which is much broader, and the *neck*, which is nearly as long as the body, but much narrower. The point of division between these two parts is frequently indicated externally by a slight constriction.

Till about the fourteenth or fifteenth year, this organ is of small size, but a considerable increase takes place at the period of puberty. In women who have borne children, its volume is permanently increased, but it is often found in advanced age to have resumed in a great measure the appearance presented in early life. It is temporarily increased in size during a menstrual period; but if examined during the interval, the virgin uterus will be found to weigh on an average about 500 grains, and to measure, in length three inches, in breadth about two inches, and in thickness (*i. e.*, from before backwards) one inch. Its situation varies according to age. In the fœtus it is altogether above the brim, but from this position it gradually descends after birth, although it is not till the tenth year or even later that the fundus falls to the level of the brim plane. The uterus is, when healthy and normal, united with the surrounding parts by means of certain structures to be described presently. The nature of this union is essentially lax, admitting of pretty free movement in all directions, which may easily be tested by the finger, and which enables it to accommodate its position according to the degree of distension of the neighboring hollow viscera. This laxity admits too of the free expansion of the uterus during the course of pregnancy, but unfortunately it may also give rise to certain displacements, which will be duly considered in the proper place, in so far as these have a bearing upon the practice of midwifery. These displacements are prolapse or *procidentia*; *anteversion* and *anteflexion*, *retroversion* and *retroflexion*; and *lateral* displacements; terms which explain themselves.

The axis of the virgin uterus must, therefore, be constantly changing, now backwards and now forwards, according as vesical or rectal distension prevails. It is thus a matter of no little difficulty to determine what may be regarded as the normal axis of the uterus, and in all attempts which have been made by anatomists with this view, it has been usual to consider the parts to be in their normal relative position when the bladder and rectum are each moderately distended. The opinion which is usually adopted, and which is founded on estimates of this nature, is, as has been said, that the axis of the uterus is identical with the axis of the pelvic brim. It is admitted that, in many cases, and especially in those in which the vagina is very short, the fundus falls more or less backwards so as to bring the uterine axis more into a line with that of the vagina, while in some cases the uterus is curved so that the body forms an angle with the neck.

This bending of the uterine axis, instead of being admitted as an exception, is recognized by many of the best authorities as the normal position of the womb, a view which careful personal observation leads us to confirm. It is a point of great importance, in making examination on the living subject, that it should be clearly recognized that the finger, in a digital examination, approaches the os uteri in a direction corresponding to the axis of the vagina, which frequently forms nearly a right angle with the uterus. If this is overlooked, error is sure to creep into our calculations, as has evidently been the case in certain instances of inaccurate description of the anatomical relations of the womb. The opinion here expressed as to the position of the womb is in accordance with that of Kohlrausch, as shown in his plates, and is confirmed by Dr. A. Farre in his admirable essay in the Clyclopædia of Anatomy and Physiology, from which the diagram (Fig. 23) is taken. According to these able observers, when the bladder B and the rectum C are moderately distended, the fundus of the uterus is directed upwards and forwards, and the neck downwards and very slightly backwards towards the orifice of the rectum. The relative heights of these parts are determined, it is assumed, by two lines: the one, *a*—*a*, being drawn from the lower border of the symphysis pubis to the promontory of the sacrum, to mark the height of the fundus; and the other, *b*—*b*, carried from the same point anteriorly to the lower margin of the fourth sacral vertebra behind, to mark the plane of the orifice of the uterus. The line *c*—*c* indicates the axis of the body of the uterus. The representation, therefore, given in Fig. 23 is, as regards the position of the womb, probably nearly correct, subject, of course, to numerous modifications, in consequence of its mobility, and the influence exercised upon it by neighboring organs.

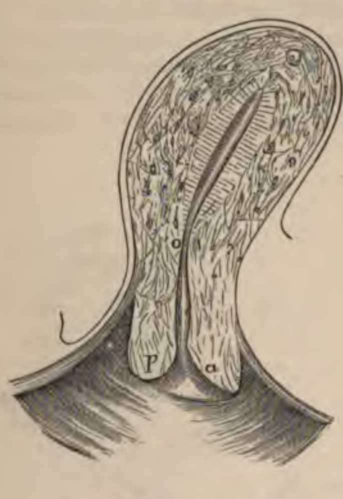
FIG. 23.



Diagram, showing relative position of pelvic viscera. (A. Farre.)

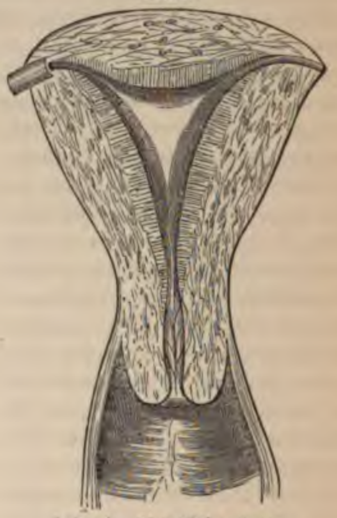
The interior of the uterus corresponds in some measure with its external surface. It is divided into two parts by a constriction not far below its middle, which indicates the point at which the cavity of the cervix ends, and that of the body begins. This constriction, which is the usual cause of the difficulty experienced in passing the instrument known as the uterine sound, is called the *os uteri internum*, the orifice communicating with the vagina being named the *os tincæ*, *os externum*, or, more generally, the *os uteri*. In a profile section (Fig. 24) the anterior and posterior walls are shown to be almost in apposition, this being, however, more complete at the internal os, *o*. From this point the cavity of the body extends upwards to the fundus, while that of the cervix reaches downwards, and terminates at the external os. The neck of the uterus is divided, as will be observed, into two portions, upper and lower, by the point of reflection of the vaginal mucous membrane, the lower part being called the vaginal part of the cervix. Viewed thus, the os is composed, as may be noticed, of two lips, *a*, anterior, and *p*, posterior, of which the former is generally described as the longer. This, however, which is more apparent than real, is caused by the position of the uterus as regards the pelvis, which brings the anterior lips lower in the vagina, and thus makes it seem longer than it really is in reference to the long axis of the organs. The vagina reaches somewhat higher on the posterior than it does on the anterior lip.

FIG. 24.



Profile section of the uterus.

FIG. 25.

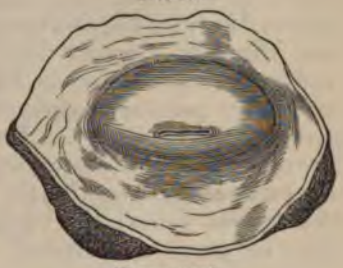


Lateral section of the uterus.

If we now make a transverse section as shown in the accompanying diagram (Fig. 25), it is to be noticed, in the first place, that the cavity of the cervix, as well as that of the body, is expanded from side to side, owing to the approximation of the anterior and posterior walls as shown in the previous figure. The cavity of the cervix then is, being somewhat flattened from before backward, irregularly fusiform. Its lining membrane presents a peculiar appearance, being thrown into irregular folds, which branch laterally from a raphé or median line, in a direction generally upwards. This arborescent appearance has given rise to the name under which it is known to anatomists, the *arbor vitæ uterinus,* and it has been observed that, in the uteri of very young children, these folds are traced much higher than in the internal os, which is their limit in the adult. The cavity of the body is from this point of view triangular in shape, smooth on its surface, and having three openings leading into it, one at the internal os or apex of the triangle, and one at each angle of the uterus, leading right and left into the Fallopian tubes. Some rare instances of congenital absence of this cavity have been recorded: what is more common is adhesion of the walls in old age.

The os uteri, as felt by the finger, or as seen through the speculum, is a transverse opening or slit, which, in the virgin, and in the absence of structural disease, is perfectly smooth. In these circumstances, the aperture is closed, but the depression between the lips is easily felt, and is precisely similar, in the impression it communicates to the finger, to the sensation experienced when the finger is applied to the tip of the nose. In this case the cartilages represent the firm tissue of the lips, while the vertical interval between them corresponds to the transverse slit which constitutes the os.

FIG. 26.



The os uteri.

The characteristics above described are those of the virgin, or, as Dr. Tyler Smith more correctly calls it, the "nulliparous" uterus. During pregnancy, the organ is enormously distended, and the anatomical relations of the contiguous parts are greatly disturbed. After delivery the parts contract, and regain in a great measure their original appearance and condition; but they nevertheless retain features of dissimilarity which generally enable the observer, on a careful examination, to distinguish the uterus of a woman who has been a mother. The chief points of distinction are as follows. The weight of the organ is increased, according to Meckel, to about an ounce and a half; the fundus and body are rounded externally; the cavity of the body loses its triangular shape, and becomes much larger relatively to the cervix, the os internum being agape. The arborescent folds of the cervix are in a great measure obliterated, or at least are rendered indistinct, and the os externum is patent. The differences in the latter are, from the fact of its being of easy access to the finger, of special importance, and consist mainly in an enlargement of the parts, and an irregularity in the surface of the lips, which are now no longer smooth, but puckered round the edge of the os, and often nodulated on the surface. These irregularities are due to slight lacerations of tissue which occur during delivery. They are always more marked in women who have borne many children, where the lips are not unfrequently divided into lobes by shallow furrows, representing these lacerations, and which radiate from the os as from a centre. These fissures are generally observed at the sides or angles of the os, and are, according to Cazeaux, much oftener on the left than on the right side.

The uterus, then, as may be inferred from what has been said, presents a fundus, more or less rounded according as the woman has or has not borne children, two borders laterally, and an anterior and posterior surface, of which the latter is the more convex. It consists of three constituent layers; a serous or investing coat; a mucous or lining coat; and an intermediate thick layer of fibro-muscular structure constituting the proper tissue of the uterus. Each of these requires special and very careful consideration.

The Serous Coat.—Along with this, we shall consider certain structures very intimately connected with it, which are described as the *Ligaments of the Uterus.* The great serous membrane, which invests almost the whole of the abdominal viscera, is also reflected over the greater part of the womb. Passing backwards over the fundus of the bladder, the peritoneum becomes reflected upwards on the anterior surface of the uterus from a point, which in the virgin uterus is about midway between the os externum and internum, a space being thus left (see Fig. 22), through which direct communication may take place between the uterus and the bladder. This may occur as an accident in midwifery practice, constituting a vesico-uterine fistula, as in a case reported by the writer.[1] From the front to the back of the uterus, the membrane now passes over the fundus, and investing the whole of the posterior surface with the exception of the vaginal portion, reaches downwards behind the vagina, in the manner already described, to form the pouch of Douglas. The manner in which the uterus is thus embraced by the peritoneum in its course from before backward is peculiar. Instead of investing the lateral parts of the organ in the same manner as the anterior and posterior walls, it is stretched from side to side of the pelvis, forming, in fact, a double layer of peritoneum, in the centre of which the uterus is confined. These folds, intimately connected on either side with important organs, to be presently described, are the *broad ligaments* of the uterus.

Looking from above downwards in the axis of the brim, it will be noticed that the broad ligaments, with the uterus *u*, form a partition or curtain, dividing the cavity of the pelvis into two parts, anterior and posterior, of which the anterior is occupied mainly by the bladder *b* and the pouch which separates it from the womb, and the posterior by the rectum *r* and the pouch of Douglas. It will also be observed that the greater convexity, and, indeed, the bulk of the uterus, projects into the posterior of the two cavities. The attachment of the broad ligament is in point of fact to the anterior lip of the lateral border of the womb.

If, therefore, the uterus and the broad ligament are viewed from before, as in Fig. 28, the fundus and body of the uterus are indeed indicated, as well as the situation of other parts to be mentioned immediately, and the relation which they all bear to the vagina, but the parts themselves are only to be distinctly demonstrated by turning our attention to the posterior surface of the pelvic partition, as shown in Fig. 29, where the posterior wall of the uterus has been removed, in order to show the interior of the organ. The peculiar structure of the cavity of the cervix, the anterior lip of the os, and the anterior wall of the vagina are also shown, as also the triangular space bounded inferiorly by the ovary and its ligaments, which, from a fanciful resemblance to a bat's wing, has been called *ala vespertilionis*.

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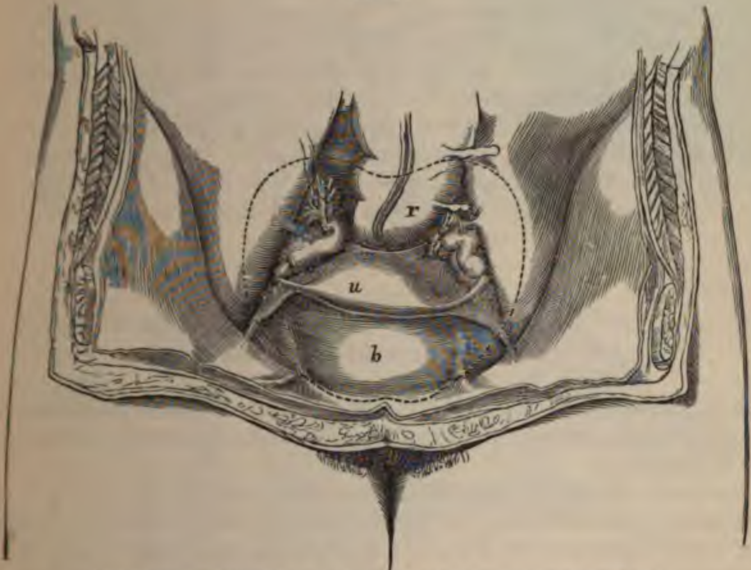
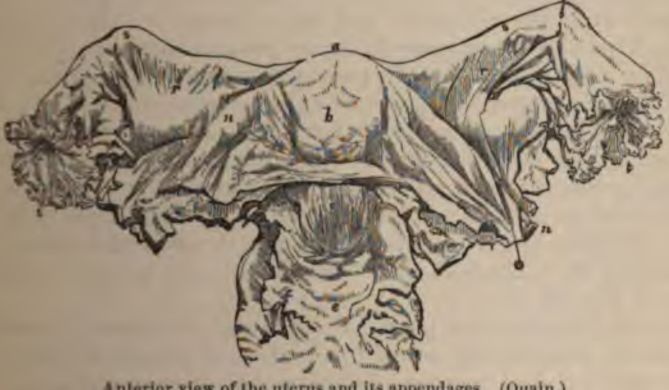
[1] Glasgow Medical Journal, 1862.

FIG. 27.



Pelvic organs *in situ*, viewed in the axis of the brim. (After Schultze.)

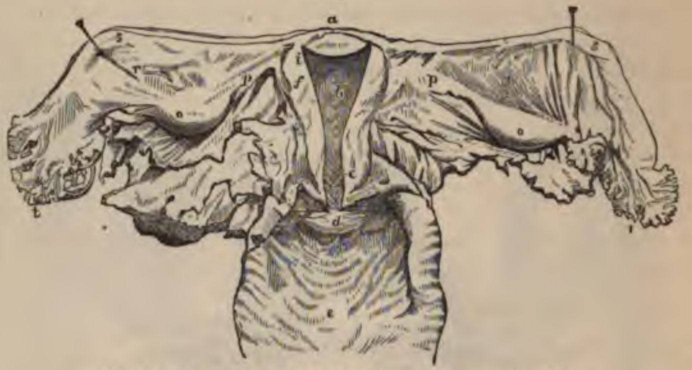
FIG. 28.



Anterior view of the uterus and its appendages. (Quain.)

It is thus very apparent that the effect of the broad ligament is to maintain the uterus in its central position as regards the pelvic cavity, and to prevent its displacement downwards, while it admits of very free antero-posterior movement, corresponding to the distension of the bladder or rectum.

FIG. 29.

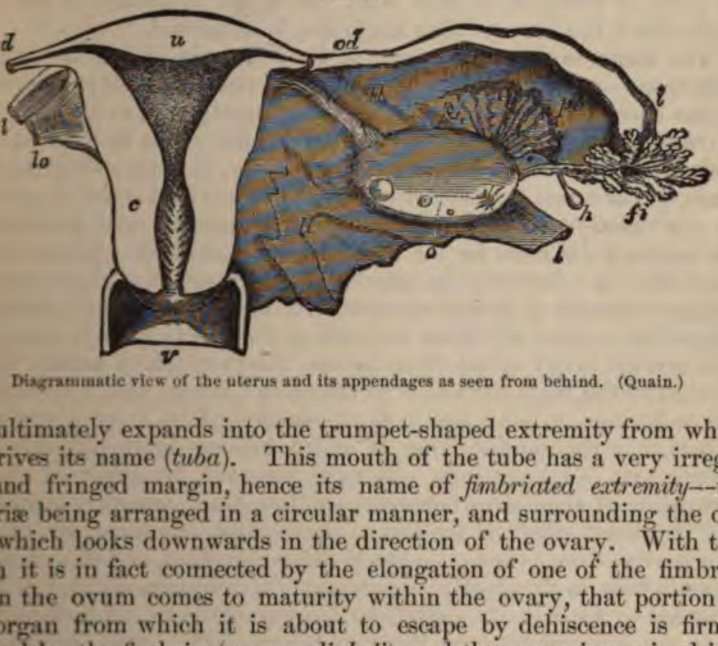


Posterior view of the uterus and its appendages. (Quain.)

Between the two layers which constitute the broad ligament, and occupying each a fold more or less distinct, are the following structures: the *round ligament* (see Fig. 27), a cord-like bundle of fibres, partly muscular, and about four and a half to five inches in length, which has its course on each side from the angle of the uterus, first upwards and outwards, and then forwards and a little inwards to the internal inguinal ring. Passing, like the spermatic cord in the male, through the inguinal canal, and invested by a peritoneal sheath which has been called the canal of Nuck, its fibres expand and are lost in the mons veneris, some of them having been traced to the purse-shaped cavity in the labia majora already described. According to Madame Boivin, the ligament of the right side is a little shorter and thicker than the other. Two small semilunar folds are seen on this aspect, which are formed by the peritoneum in its passage from the uterus to the bladder, and which limit laterally the pouch existing between these two organs. They are called the *vesico-uterine* ligaments. The uterus is generally observed to be a little more to the right than to the left side; and it is asserted by Schultze and others that in the normal position it is somewhat twisted on its axis so as to turn the anterior surface a little to the right. On this observation is grounded a theory which Schultze has propounded as to the position of the child in the womb. All this is shown in Fig. 27.

Reverting now to the posterior surface of the broad ligament, we find several parts which are of the highest physiological importance. At the upper or free margin of the broad ligaments, and occupying a portion of the space between its layers, there extends from each angle of the uterus a thick cord, which is between three and four inches in length. This is found, on dissection, to be traversed in its whole extent by a canal of small diameter, and is familiarly known to anatomists as the *Fallopian tube* (*oviduct*). It is composed in a great measure of muscular tissue of the nonstriated variety, which is disposed in layers, an external one of longitudinal, and an internal of circular fibres. Along with this is areolar tissue, the whole being embraced by the peritoneum in the manner described. The canal is lined with mucous membrane, with an epithelium of the columnar and ciliated variety, continuous at one extremity with the mucous membrane of the uterus, and at the other with the inner surface of the peritoneum—a unique example of a mucous being continuous with a serous membrane, and of a serous cavity which is not absolutely a closed sac. The tube is small, and its cavity narrow at the uterine end, barely permitting the passage of an ordinary bristle, but it becomes dilated in its course outwards, and ultimately expands into the trumpet-shaped extremity from which it derives its name (*tuba*). This mouth of the tube has a very irregular and fringed margin, hence its name of *fimbriated extremity*—the fimbriæ being arranged in a circular manner, and surrounding the orifice, which looks downwards in the direction of the ovary. With this organ it is in fact connected by the elongation of one of the fimbriæ. When the ovum comes to maturity within the ovary, that portion of the organ from which it is about to escape by dehiscence is firmly grasped by the fimbriæ (*morsus diaboli*), and the ovum is received into the oviduct, and by it conducted to the uterus, where it is retained and developed, or whence it is discharged, according to circumstances.

FIG. 30.



Diagrammatic view of the uterus and its appendages as seen from behind. (Quain.)

Leading from the inner extremity of the ovary—an organ to be hereafter described—is a dense cord, composed mainly of fibro-areolar tissue, but containing also muscular fibres. This is the *ligament of the ovary*, which is also, like the round ligament and the Fallopian tube, firmly united to the angle of the uterus at a point behind and below the latter, and is about an inch and a half in length. The *parovarium*, or Organ of Rosenmüller (Fig. 30, *p o*), is situated between the layers of the broad ligament, and can usually be brought into view by holding up to the light that portion of the ligament which is between the outer part of the ovary and the Fallopian tube. According to the observations of M. Follin, the parovarium is usually composed of from seven to ten tubules, which are convoluted and end in a cul-de-sac, all converging towards the tube through which the vessels of the ovary pass. These tubes exist at all ages, but are more distinct in children, and still more so in the fœtus. In no instance have they been found to have an orifice, but there seems good reason to believe that they are the remains of the embryonic organs, known as the Wolffian bodies. It is more than likely that the little cysts which are so frequently found in this situation, and which are usually pediculated, have some anatomical connection with the parovarium. From the back of the uterus on each side, crescentic folds of peritoneum pass backwards towards the rectum (Fig. 27). They are more marked than the vesico-uterine folds, previously described, and are called the *posterior* or *recto-uterine* ligaments, or folds of Douglas, as they mark the upper boundary of the pouch with which the name of this anatomist is associated.

The uterus is thus—by means of its ligaments and other auxiliary structures—so suspended in the cavity of the true pelvis as to admit, as has been shown, of tolerably free movement; and, at the same time, to restrict its mobility within certain limits. The movement of the body from side to side is curtailed effectively, in a healthy state of the parts, by the broad ligament, while displacement backwards is prevented by the vesico-uterine folds and the round ligament, and movement in the contrary direction by the recto-uterine ligaments. Undue importance must not, however, be attached to the function of these structures as ligaments; for it is very obvious that other parts (and in an especial degree the vagina) aid them in holding the uterus thus in suspension. The general laxity of all these tissues, however, which nature permits in view of the higher function of the uterus, is very apt, under disturbing influences, to give rise to displacements which have already been named, but the consideration of which belongs more properly to the department of gynæcology. It may, however, be observed that the symptoms of these displacements are, in a great measure, mechanical, and the direct result of the loss of equilibrium—as those, for example, which arise from pressure on the bladder or rectum, and the pain in the groin which is frequently experienced in retroversion, and which is assumed by Cazeaux to arise from tension of the round ligament.

In the interval between the two layers of the broad ligament, and associated with the other structures above described, there is found a considerable quantity of loose and extensible cellular tissue. This admits of the complete alteration in the anatomical relations of the parts which occurs during pregnancy, and which is further provided for by the manner in which the uterus is attached to its serous investment. The nature of the connection is firm at the fundus, and lax at the sides, where the peritoneum may be made on a dissection to move to and fro upon the subjacent tissue of the organ. The manner in which the neighboring parts accommodate themselves to the distension of the womb during pregnancy will fall to be considered in a subsequent chapter.

CHAPTER IV.

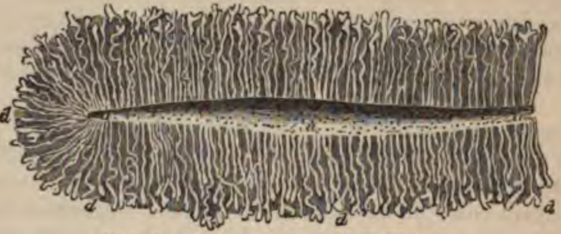
FEMALE ORGANS OF GENERATION—(CONTINUED.)

OF THE PROPER TISSUE OF THE UTERUS—OF THE MUCOUS LAYER; ITS STRUCTURE AND GLANDS, IN THE BODY AND CERVIX—BLOODVESSELS OF THE UTERUS—LYMPHATICS AND NERVES—MALFORMATIONS AND ABNORMAL CONDITIONS—THE OVARIES: THEIR STRUCTURE—THE GRAAFIAN VESICLES AND THEIR DEVELOPMENT—THE OVUM—PHENOMENA OF OVULATION—FORMATION OF THE CORPUS LUTEUM—THE CORPUS LUTEUM OF PREGNANCY DISTINGUISHED.

THE *Proper Tissue*, which lies immediately beneath the peritoneum, and which constitutes the greater part of the walls of the uterus, is very dense in structure, and, except during pregnancy or a menstrual period, is of a grayish color in section, and displays numerous bloodvessels, some of them of considerable size. It is thickest at the middle of the body and at the fundus, thinnest at the Fallopian tubes, and is composed throughout of bundles of muscular fibres of the plain variety. These fibres in the unimpregnated condition are interlaced, disposed very irregularly in bands and layers, and mixed with fibro-areolar tissue, which is more abundant near the external surface. As in the case of other hollow viscera, the muscular elements may be described as consisting of an external layer, the fibres of which have a general longitudinal direction, and of an internal or circular layer. From the irregular manner, however, in which, in the unimpregnated uterus, the bundles of fibres are disposed, and the intimate union which subsists between them, this seems on the first glance to be somewhat of a forced analogy. And it would probably remain so, were it not that during pregnancy the stratification of the muscular tissue becomes much more distinct, so as to render the comparison quite justifiable, a fact which will be brought out more clearly afterwards. Anatomists usually divide this tissue into three layers, external, intermediate, and internal.

Mucous Membrane.—The very existence of this membrane was long disputed, the obvious reason being that it differs so much from other mucous membranes, that physiologists with some show of reason refused to admit the analogy. More modern and more exact observations, however, leave no doubt in these days as to the propriety of classifying it as it is here named. The descriptions which are usually given of this membrane by anatomists are very meagre, and in some respects inaccurate; this may serve as our warrant for examining its structure and functions a little more in detail than under other circumstances might have been necessary. Although usually described as a thin membrane, it is, on the contrary, probably the thickest mucous membrane in the body, constituting, according to M. Coste, in the cavity, about one-fourth of the entire thickness of the organ. In this situation, it is of a reddish tint, but in the cervix, where it is much thinner, it is paler in color, the thinning occurring somewhat abruptly at the os internum. It is firmly adherent to the subjacent muscular tissues, and cannot, in consequence of the sparseness of the submucous cellular tissue, be made to glide upon the part which it covers. The surface of the membrane is smooth, and abundantly studded over with minute dots, which are found on closer examination to be the orifices of numerous utricular glands, which run through the entire thickness of the membrane in a direction perpendicular to its surface. Fig. 31 represents a part of the cavity of the uterus which shows in section—*a*, the orifices of the glands, and *d*, the glands themselves. They were believed by Weber, and are here represented, as being, at the commencement of pregnancy, greatly convoluted, and sometimes bifurcated at the extremities. The more recent and exact observations of M. Robin, show, however, that when *in situ*, they are rather undulated than convoluted, that they are never spiral, although, as in Fig. 32, they may appear so when separated, and never bifurcating. During pregnancy and menstruation, they become greatly enlarged, and sometimes cross each other, an appearance which in all probability has led to the idea of a division of the tube. They are simple utricular glands, parallel to each other, ending in a cul-de-sac, and permeating the entire membrane. They are lined by nucleated ovoid epithelial cells, their walls being finely granular, and very firmly adherent to the tissue which intervenes between them. Their length measures exactly the thickness of the mucous membrane, and is least, therefore, where the membrane becomes thinner, on its approach to the os internum and the orifice of the Fallopian tubes. "If we except that of the stomach," says M. Robin,[1] "there is no mucous membrane more rich in glandular follicles than that of the uterus."

FIG. 31.



Utricular glands of uterus. (E. H. Weber.)

In the unimpregnated uterus, in an intermenstrual period, the utricular glands are not very easily seen; but if their sections are treated with acetic acid or concentrated tartaric acid, and viewed by transmitted light, they can generally be made out. They terminate quite abruptly at the inner margin of the muscular coat, the point of junction being very distinctly indicated by the muscular fibres running at right angles with the tubes. The glands were supposed by Sharpey to penetrate the muscular tissue, but this view is now generally regarded as an erroneous one. Their abrupt termination is well shown by a reference to Fig. 33. In the same preparation, which was taken from the uterus

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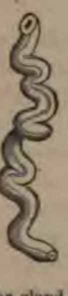
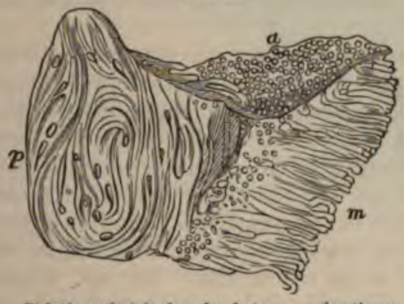
[1] De la Muqueuse Utérine. Paris, 1861.

FIG. 32.



Utricular gland of the uterus. (Coste.)

FIG. 33.

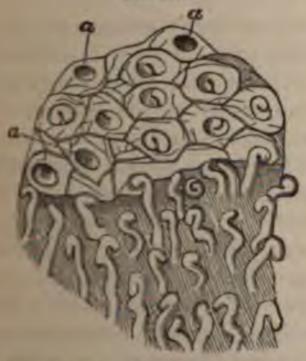


Relation of utricular glands to muscular tissue of uterus. (Coste.)

of a young girl who had committed suicide in the intermenstrual period, is also shown the general direction of the fibres composing the proper tissue of the uterus, *p*, as compared with the course of the tubules from the free surface of the mucous membrane at *m*. At *a* the tubes are cut across, and shown obliquely in section, and the course of the bloodvessels which accompany them is also indicated between *m* and the adjacent part of the muscular tissue.

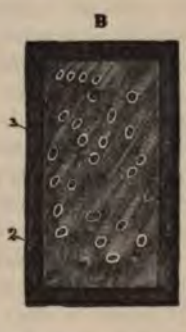
Fig. 34, also taken from Coste's beautiful plates, shows a detached portion of the mucous membrane in the same case. Little funnel-shaped depressions are shown at *a*, into which the orifices of the tubes open. The actual glandular orifices are distinctly shown elsewhere on

FIG. 34.



Termination of utricular glands on mucous surface of uterus.

FIG. 35.



Utricular orifices of uterus. (Sharpey.)

the surface of the membrane. From one portion, the epithelium has been stripped off, so as to show the termination of the tubes free and floating. But what is most distinctly shown here, is the perfect network of vessels which surrounds the orifices, which is always to be observed most distinctly at those seasons when the functional activity of the uterus is excited.

Fig. 35 is a small portion of the mucous membrane, as observed after recent impregnation. This specimen is represented as viewed upon a dark ground, and also shows the orifices of the uterine glands, in most of which, as at 1, the epithelium remains, and in some, as at 2, it has been lost.

The mucous membrane is smooth on its surface, which is composed of columnar and ciliated epithelium. Cruveilhier describes it, however, as presenting indistinct papillæ, while some earlier physiologists insist that it is studded with free villi; errors which have probably had their origin, as M. Robin assumes, in the extremities of the glandular follicles becoming liberated from their epithelial attachment by post-mortem change, and which find in analogy an apparent corroboration in the condition of the membrane, as observed in the uterine cornua of some mammalia. During pregnancy, the epithelium becomes transformed; it loses all trace of the vibratile cilia, and the cells are changed from the columnar to the pavement variety.

Berres[1] was the author of the erroneous hypothesis that the villi of the placenta plunged into these glands, to be there bathed in materials destined for the fœtal blood,—a view which was afterwards supported by Bischoff,[2] but which now receives little if any support. M. Coste[3] was undoubtedly the first who gave a complete description of the mucous membrane during menstruation and the various stages of pregnancy. To him the merit is also due of having first demonstrated what is now all but universally admitted, that the maternal covering of the ovum (*decidua*), of which we shall have more to say, is not a new formation, as Hunter taught, but is the mucous membrane itself, altered and modified to suit the circumstances of the case. The views of Coste have received the most remarkable confirmation by the subsequent observations of Richard, and by the still more recent researches of Robin.

The mucous membrane of the uterine cavity is continuous at the angles with that which lines the Fallopian tubes. At the internal os it becomes much thinner, with fewer glands, and loses many of its special characteristics as it passes into the cavity of the cervix. The presence of the folds, which give to it in this situation an arborescent appearance, has already been noticed. The extent of the inner surface of the cervix is thus greatly increased, an arrangement which not only admits of free dilatation of the parts, but also furnishes a greatly increased secretory surface. It has been computed by Dr. Tyler Smith that, in a well-developed virgin uterus, the follicles of the cervix (*glandulæ Nabothi*) are not less in number than ten thousand. These glands secrete a clear tenacious fluid, which is alkaline in reaction, and which is often seen, on vaginal examination, to occupy the os externum, and they are liable during pregnancy to a very remarkable hypertrophy. The mucus which lubricates the parts during delivery is mainly derived from this source, and in certain morbid conditions it is greatly increased in quantity, when it is either secreted of an acid reaction, or loses its alkalinity, and also its transparency, by contact with the acid mucus of the vagina. The cavity of the cervix is lined with an epithelium, which, in its lower half, is squamous, like that of the vagina. About midway between the outer and inner os, it assumes the characteristics of the ciliated and columnar epithelium of the cavity.

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[1] Medicinische Jahrbücher des K. K. Œsterreich. Staates. Wien, 1837.

[2] Traité du développement de l'homme, &c., 1845.

[3] Histoire du développement des Corps Organisés. Paris, 1847.

The uterus is supplied with blood from two sources. The *ovarian* arteries have their origin, like the spermatic in the male, from the aorta, at a point a little below the renal arteries. Passing over the psoas muscles, and occupying a fold in the peritoneum, which is indicated in Fig. 27, they pass between the layers of the broad ligaments, forming what have been described as the ovario-pelvic ligaments. They follow, in their course towards the ovary, an extremely tortuous course, which admits of free distension during pregnancy without any risk of diminution of their calibre. Giving off branches to the ovary and round ligament, they now pass inwards to join the *uterine* arteries on each side. These latter spring from the anterior division of the internal iliac, pass between the layers of the broad ligament downwards towards the neck of the uterus, then upwards, pursuing, like the ovarian arteries, a very tortuous course, and, giving off numerous branches to the uterus, effect a union with the ovarian. Frequent anastomoses take place, and the branches may be seen to lie in little canals or channels on the surface of the uterus, before they penetrate more deeply. The veins correspond to the arteries just named, and are of considerable size. They form plexuses, which communicate freely, and during pregnancy their calibre becomes enormously increased. Within the substance of the uterus, the ramifications of the arteries retain their spiral form, but became straighter as they approach the mucous membrane, where fine branches surround the utricular glands, and ultimately form, as has been shown (Fig. 34), a fine network on the free surface of the membrane. The veins which convey the returning current are, at their origin, of small size, but become much larger within the substance of the womb, attaining during pregnancy a size so considerable that they are designated the *uterine sinuses.* The cervix is very much less vascular than the body and fundus.

Numerous lymphatics, which are fully developed only during pregnancy, have been traced to the uterus. Some doubt still exists, however, as to the precise source of the nervous supply. All agree that the chief supply is from the sympathetic system,—the hypogastric, renal, and inferior aortic plexuses being all believed to contribute. An idea generally entertained is, that the sacral nerves send some filaments to the cervix, but this has been denied by Dr. Snow Beck,[1] who failed in his dissections to discover any single filament proceeding from this source. M. Jobert has asserted, again, that no nerves whatever are sent to the vaginal portion of the cervix; but this has been warmly refuted by M. Boulard. There can be no doubt that the presence in the cervix of filaments from a cerebro-spinal source, and the absence from its vaginal portion of all nerves whatever, are both observations which, if confirmed, would tend to throw some light on certain physiological and pathological facts.

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[1] Philosophical Transactions, 1846. Part II, p. 219.

While, as a rule, in the Mammalia the vagina is single, the contrary is the case as regards the womb. In the female human embryo, the uterus is formed by the fusion together of the two ducts of Müller—which are the efferent tubes of the rudimentary generative apparatus. These meet together inferiorly, become gradually united from below upwards, and ultimately form a single cavity by the absorption of the partition between the two, so that there is a stage in development, at which the human uterus is composed of two separate and distinct tubes. It follows, from the manner in which they become united, that there are a series of subsequent stages at which the partly developed organ may be termed *uterus bicollis*—when the necks are still separate; *bicorporeus*—when the union has reached the os internum; *bifundalis*—when the fundus alone is divided; *biangularis;* and, finally, the *uterus simplex*—the highest or perfect human form. In the other Mammalia, the process is so far identical, but may be arrested at any stage to form the uterus natural to the group to which the individual belongs. In the Marsupials, not only are the uteri separate, but also the vaginæ, which terminate in a uro-genital canal—presenting, in this respect, a remarkable analogy to the same parts in birds. In a large number of the Rodents, the vagina is single, and into its fundus two distinct uterine cavities open by separate apertures; while, in some, there is a partial separation of the vagina for about a third of its length. The commencing union of the cervix is shown in some groups of the same order—as the Muridæ—where there is a very short common cavity. The confounding of the two uterine cavities may be traced in various progressive stages by an examination of the internal organs of certain of the Carnivora, the Ruminants, the Ungulata, the Edentata, and the Simiina; but even in women there still remains in the angles of the uterus a trace of the original bifurcation.

This reference to the development of these parts, and, for the analogy, to their condition in the lower animals, will be found to throw light upon certain cases of malformation or peculiarity of structure in the human subject, which apparently consist, for the most part, of a simple arrest of development. Taking the particulars above noted as a basis of classification, we may adopt the division in regard to those abnormalities which Dr. A. Farre, in his Essay on the Uterus,[1] has selected as the best. Of this section of his admirable monograph, the following remarks are in great part an abstract.

Group 1. Complete absence of the uterus, both of the ducts of Müller being imperfect or undeveloped. In the cases of total absence of uterus which have been recorded, it seems certain that, in a very large proportion at least, something of a rudimentary organ existed in the fold of the peritoneum lying behind the bladder, and representing the broad ligament. They usually occur under the form of two hollow rounded cords, or bands of uterine tissue, extending upwards towards the ovaries. The vagina may be absent or rudimentary, as also the

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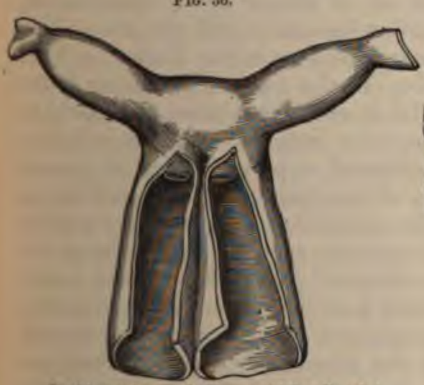
[1] Cyclopædia of Anatomy and Physiology. Art. "Uterus." 1859.

Fallopian tubes; but it is interesting to observe that the ovaries may be perfect in these cases—a fact easy of explanation, when we remember that the ovary is formed out of a separate portion of blastema from the Wolffian bodies and duct of Müller.

Group 2. One uterine cornu only may retain the imperfect condition last described, while the second develops, so that we now have what has been called the *uterus unicornis*. In this condition, which represents the type of the normal condition in birds, both ovaries may be found perfectly developed.

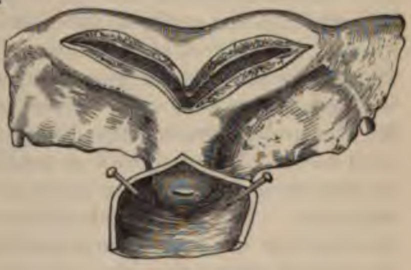
Group 3. When development progresses in both cornua, and these do not, as under ordinary circumstances, unite, various peculiarities result, which cause the uterus to assume, according to the degree of the malformation, a type which is lower or higher in the animal scale. "The marsupial type," says Owen, "is repeated in one of the rarer anomalies of the female organs in the human species." This, indeed, is an anomaly so rare and peculiar, that it has only been observed as coexistent with other malformations,—such as fissure of the abdominal and pelvic walls; but what is more frequently met with is the form shown in Fig. 36, where the two uterine halves meet, and are united by a commissure of true uterine tissue, which represents the fundus uteri. The higher this commissure reaches, the more does the womb approach to the normal type. In the figure there are two vaginæ, two orifices, and two uterine cavities.

FIG. 36.



Double vagina and uterus. (After Busch.)

FIG. 37.



Bifid uterus.

In the cases shown in Fig. 37, there is but one vagina. The os also is single, as is the cavity of the cervix, the bifurcation commencing about the os internum. The angle at which the cornua unite varies in different cases—which is accounted for, as is pointed out by Rokitansky, by the height at which the uniting commissure is situated.

Group 4. In this, the external form of the uterus differs but little from the normal character. The breadth of the organ is greater, especially at the fundus, where a depression in the middle lines indicates the situation internally of a vertical septum, which more or less completely divides the uterine cavity into two halves, and constitutes the *uterus bilocularis*. The extent of this septum may vary from a mere ridge to a complete partition, which may even invade the vagina.

These several deviations from the normal form of the uterus will influence more or less the function of the organ. Menstruation may, it is true, in a large proportion of cases, be scarcely affected; and this function will be normally discharged whenever the ovaries are perfect and a normal channel exists. In those rarer cases, however, in which the uterus is rudimentary, there may be perfect ovaries, and atresia either of the cervix or of the vagina, with the result, if a uterine cavity exists, of an accumulation of the discharge, and attendant symptoms of considerable severity. If, on the contrary, there be no cavity, then the menstrual molimen can only be relieved by the occurrence of what is known as vicarious menstruation. As regards the influence exercised by such anomalies upon impregnation, much will depend upon the condition of the vagina, and also of the Fallopian tube, for if either of these are closed, impregnation is of course impossible. If, however, these are open, it is quite possible for impregnation to occur even in a uterus unicornis.[1]

Great difficulty and danger will arise, in such cases, during the progress of gestation. In the case, for example, which is referred to in the footnote, death took place from rupture of the sac in the third month, the termination being thus very much what one would expect in a case in which the development of the ovum goes on in the Fallopian tube, instead of in the cavity of the womb. In the cases of the uterus bicornis and bilocularis, either side of the uterus may become separately or alternately the seat of gestation, or twins may be simultaneously developed, one on each side. There is, indeed, no good anatomical ground for absolutely rejecting the doctrine of superfœtation as a possibility in such cases. When there is a double vagina, coition usually takes place by one canal, so that successive pregnancies may be looked for on the same side. The effect produced on the act of parturition by such anomalies as have been cited, have probably been exaggerated. Rokitansky has indeed shown that the axis of expulsion may, as in the one-horned variety, be so directed as to place the forces at an obvious disadvantage; but it may be assumed that, if the anomaly has been of such a grade as to admit of complete intra-uterine development, there will not likely be any impediment during delivery, which may not be surmounted by the application of ordinary principles.

Cases in which the arrest of development has taken place after birth, are to be placed in a special category. At the ordinary period of puberty, the signs which indicate sexual maturity do not appear, while the uterus is found still to present the characters peculiar to infancy or childhood. In these cases, which are almost certainly productive of sterile marriages, there is often an absence of the vaginal portion of the cervix; and the other infantine conditions of the womb may be exhibited in every particular, such as the exaggeration of the forward curve, which, in a smaller degree, we have indicated as the normal adult condition, the persistence, within the cavity, of rugæ, similar to those of the cervix, and the thinness of the parietes.

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[1] See a remarkable case by Rokitansky, the preparation of which is in the Vienna Museum. (Pathological Anatomy—Syd. Soc., vol. ii, p 277.)

Of the Ovaries.—Projecting on either side from the posterior surface of the broad ligament, and invested with a special fold of its posterior layer, are the important organs within which is elaborated that which the woman contributes to the propagation of her species, analogous therefore in this, as in other respects, to the testicles of the male. They are connected (see Figs. 27, 28, and 29) with the uterus by a special ligament already described, and also through the Fallopian tubes, to one of the fimbriæ of which they are permanently adherent. In shape, the ovary is a flattened oval. It varies greatly in size, according to age, and in different individuals of a similar age; but it may be set down as, on an average, about eighty grains in weight, and an inch and a half in extreme length. From the manner in which it is embraced in the peritoneum, it is free on two sides, and on the posterior border, and attached to the broad ligament by a kind of mesentery along the anterior border only, where, between the layers, the vessels and nerves enter. It attains its greatest size after puberty, and is, up to this period, smooth on the surface. During pregnancy, the position of the ovary is completely changed; but in the unimpregnated condition it will be found lying deeply in the lateral posterior part of the pelvic cavity, covered by the small intestines, and to some extent by the Fallopian tube of the same side. Beneath the peritoneal covering, a remarkably tough layer, somewhat white in color from a sparseness of bloodvessels, binds the proper structure of the organ together, giving support and protection to it, and to the important structures which it contains: this is the *tunica albuginea* of the ovary. The bulk of the organ beneath this is composed of highly vascular tissue of a pinkish color, which is called the *stroma* of the ovary.

The Graafian Vesicles.—If a longitudinal section is made through a mature and healthy ovary, these vesicles are brought into view, imbedded in the stroma, and varying considerably in size. In number and in situation, they differ greatly according to age. In infants and young children, the ovary is found to be composed, within the tunica albuginea, of two distinct portions,—one internal, corresponding to the stroma in the mature organ, and the other external, of considerable thickness and density. It is in the latter, or peripheral portion alone, that, at this time, the Graafian vesicles are to be found, in enormous numbers, but as yet of small size and rudimentary condition. As puberty approaches, the distinction between the peripheral and central portion of the stroma becomes gradually more indistinct. Some of the vesicles enlarge and, according to Schrön, retreat in the first instance toward the centre of the ovary. When puberty is attained, a certain number of them enlarge, and those which have attained the greatest size approach the surface. A few of them are from $\frac{1}{20}$th to $\frac{1}{6}$th of an inch in diameter, or even more; but the great majority remain much smaller. Their number is also greatly diminished as compared with these existing in the ovaries of children, so that we may assume that a large proportion is absorbed. This number is still, however, very considerable, and has been computed by Henle at 36,000 in each ovary of a girl of eighteen. These vesicles were at one time supposed to be the ova; but it is now known to every tyro in physiology that they only contain it—hence the name *ovicapsule*, or *ovisac*. Before puberty, the ovaries are smooth on the surface, but they subsequently become scarred, wrinkled, and furrowed, in consequence of the share which they take—as we shall see immediately—in the phenomena of ovulation.

The Graafian vesicle is usually described as consisting of two coats and a granular epithelial layer—three special coverings in all. The *external* or *vascular*[1] layer is of considerable strength, and serves as a protection to the more delicate structures within. Numerous blood-vessels enter it from the stroma, and form a fine network over its whole surface. The second, or *internal* coat, is the true ovisac. It, too, is highly vascular, and its formation dates from the first appearance of the rudimentary follicle; while the thin layer of granular nucleated cells which forms the lining epithelium is the *membrana granulosa*.

The *Ovum*, in the mature condition of the Graafian vesicle, approaches its surface, and becomes imbedded in the membrana granulosa; the part of this lining membrane within which it lodges becoming developed or thickened, so as to form a nipple-shaped prominence, which is named the *granular* or *proligerous disk*, formed, like the granular membrane, of elliptical nucleated cells. The ova make their appearance in the ovary at a very early period,—before even, as some have asserted, the ovisac itself has been constructed. After the formation of the latter, and while it still remains of small size, the ovum is situated in the centre of the cavity, while the granules which ultimately form the epithelium float freely in the contained liquid. The condensation of these cells on the inner surface of the ovisac, the consequent formation of the granular membrane, and the reception within its substance of the ovum, are three circumstances which indicate that the period of maturity of the Graafian vesicle is approaching. The relation of the various parts of the vesicle is shown in the accompanying

FIG. 38.

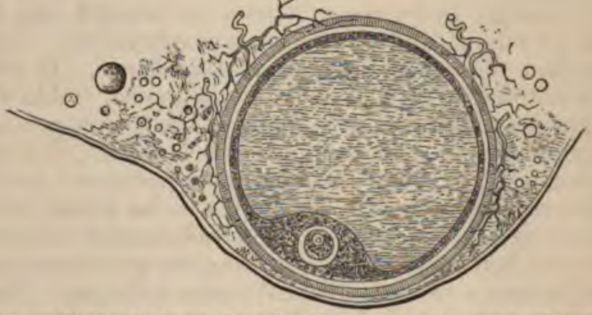

Diagram showing the layers of the Graafian vesicle, and the contained ovum.

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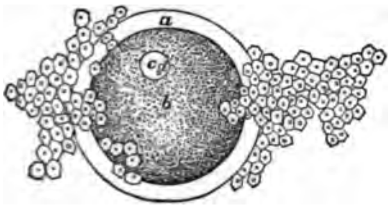
[1] This is an unfortunate term, as it is apt to convey the impression that the others are *not* vascular.

diagram. The cavity is filled with the albuminous fluid proper to it, and is lined with the membrana granulosa; in the conical projection of which, on the side next the surface of the ovary, the ovum is seen imbedded among the granules. Externally, the so-called vascular layer is indicated by the numerous bloodvessels which penetrate it; while the internal layer, or true ovisac, is left between them. The latter is represented as free from bloodvessels, in order to distinguish them in the diagram, but this is, as we have seen, an incorrect impression, which the term "vascular," as applied to the external layer only, is apt to engender. The peritoneal covering is also represented, and, within the stroma of the ovary, several minute vesicles in process of development.

If the surface of the ovary be punctured, while a mature Graafian vesicle is projecting, and the contents of the latter pressed out, a small spherical body may be observed, if care be taken, covered with granular matter in greater or less quantity. It is more opaque than the medium in which it is suspended, and is remarkably constant in size, being about $\frac{1}{120}$ of an inch in diameter. It is comprised of the following parts:

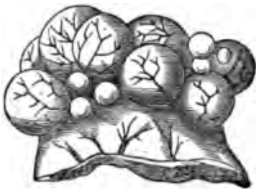
a. A thick, transparent envelope, which was called by Baer, the distinguished discoverer of the ovum in the Mammalia, the *zona pellucida.* As this refers only to its appearance, many physiologists prefer to call it the *vitelline membrane,* or *membrane of the yolk.* This membrane completely surrounds the ovum, and leaves no such circular aperture as Barry imagined to exist for the purpose of admitting the spermatozoa.

FIG. 39.



Diagrammatic representation of the ovum, as it escapes from the Graafian vesicle.

FIG. 40.



Development of Graafian vesicles in the sow.

b. The *Yolk.*—The cavity inclosed by the zona pellucida is filled with a substance which is viscid and faintly granular, and which readily escapes when the sac is ruptured. It can scarcely be described as a fluid, as it retains its spherical form after rupture of the sac, and may, according to Bischoff, be broken into segments. It has no investing membrane other than the zona pellucida.

c. The *Germinal Vesicle.*—In the middle of the yolk, in young children, and in contact, in adults, with some part of the periphery of the investing membrane, a little vesicle is found, apparently, when seen in the more opaque medium in which it is suspended, quite transparent and colorless. This is the germinal vesicle—first described in the ova of birds by Purkinje, and discovered in the Mammalian ovum by Coste. It is slightly oval, about $\frac{1}{720}$ of an inch in diameter, and surrounded by a very thin membrane. A more careful examination of it when removed from the yolk shows that it is not absolutely transparent, but contains a few scattered granules, and, in addition:

d. The *Germinal Spot* of Wagner, which may be seen close to some point or other of the inner surface of the wall of the germinal vesicle. It is probably formed by the aggregation of cells and granules which give to it a greater opacity than characterizes the contents of the vesicle. It measures about $\frac{1}{3500}$ to $\frac{1}{2500}$ of an inch.

These, then, are the parts of which the mature ovum, prior to impregnation, consists. On the approach of puberty, as has been seen, several Graafian vesicles, each containing an ovum, approach the surface of the ovary. As they increase in size, they form little projections beneath the peritoneum. In those animals where several ova are simultaneously fecundated—as in the sow (Fig. 40)—there may be observed on the surface of the ovary a number of little cystic growths; but in the human species, where the fecundation of more than one ovum at a time is exceptional, the Graafian vesicles, as a rule, come to maturity one by one.

The changes which take place during the maturation and discharge of the ova, and which are associated with the "rut" in many of the lower Mammalia, and with menstruation in women, constitute the phenomena of *Ovulation.* These changes are manifested not only in the Graafian vesicle, but also in all the component parts of the internal generative system.

It has already been observed that the development of the Graafian vesicle is due, in a great measure, to the increase in its fluid contents. While this is taking place, the vascularity is notably increased, not only in the vesicle itself, but in the contiguous portion of the ovary, and, in some degree, throughout the whole of the organ. The walls of the follicles become thickened, except at the part where rupture is about to take place, and a certain amount of blood is said to be effused into the cavity. This has frequently been observed (although even that has been disputed) in the sac of ruptured follicles; but the researches of Pouchet—whose views are confirmed by Farre—seem to show that an actual sanguineous discharge may take place into the follicle at a period prior to its rupture. According to Pouchet, the effect of this discharge is, mechanically, to force the ovum towards that part of the ovisac which is next the peritoneum, it being, before this, generally found on the deep or distal side.

An increased vascularity is now observed, externally, over the salient portion of the vesicle. The enlarged vessels obviously course, not only through the proper coverings of the Graafian vesicle, but in the peritoneum and tunica albuginea. The tissues become, about the centre of the projection, more and more thinned, until at last they yield, the ovum then escaping by a process analogous to dehiscence. Assuming the theories above-mentioned to be correct, the bursting of the vesicle is due not merely to an augmentation of its fluid contents, but to a thickening of its internal layer, which becomes at the same time irregular in outline and yellowish in color; and also to an effusion of blood, which has been termed the menstruation of the follicle.

This evolution of the ovum is accompanied by important changes in various parts besides the ovary. In so far as the uterus is concerned, these changes will come to be considered under Menstruation. At present it need only be observed that the whole of these organs become engorged. The Fallopian tube loses its pale color internally, and often becomes of a violet hue from extreme congestion. This is more marked towards the fimbriated extremity, which completely embraces that portion of the ovary where the mature vesicle is about to give way. The ovum is thus received *into* the Fallopian tube, but the rupture which admits of the dehiscence does not terminate the series of changes of which the ovary is the seat.

Before attempting a description of these changes, however, we must consider for a moment the conditions under which rupture of the Graafian vesicle occurs, and the laws which determine this rupture.

The celebrated experiments of Bischoff, as detailed in his well-known work,[1] have supplied most of the facts upon which, even at the present day, the conclusions of physiologists on this subject are based. From these, and from the corroborative results obtained by subsequent observers, it is clear that ova may, in the mammalia, as in animals lower in the scale, be discharged from the ovary independently of sexual intercourse, or of any kind of influence from the male.[2] In other words, sexual contact or excitement is not, as the earlier observers down to Barry believed, the one essential determining cause of the discharge of ova. From experiments on rabbits, which were conducted by Coste, it seems, however, more than probable that sexual congress may precipitate a rupture which, but for the excitement, would have been delayed. The immediate cause which leads to a rupture is thus somewhat obscure, but we recognize the fact that the occurrence is intimately associated with the phenomena of ovulation, of which, in women, the periodic menstrual flow is the external manifestation.

We have already seen that the internal layer of the Graafian vesicle presents a yellow color previous to its rupture, becomes wavy in outline, and is very considerably thicker. This change of color has been shown by Farre to be due to the presence of very minute oil granules, which give to the structure a yellow hue; hence the name given to the follicle during the period of decline—the *Corpus Luteum.* After rupture, a laceration, fissure, or scar, marks on the surface of the ovary, the spot whence the ovum escaped, and a longitudinal section, made through the ovary in this situation, will generally bring the yellow body into view. At first its distinguishing characteristics are but faintly shown; and it is this fact which caused Raciborski to assert that the corpus luteum was not found before rupture. Undoubtedly, however, the first stage of its formation is while the ovum is still within the vesicle; but it is only after rupture that the change in color becomes quite distinct—a change which Raciborski supposed to be due to an absorption of coloring matter from the blood-clot which fills the cavity. Whether it is due in part to this, or wholly to a farther development of oil granules in the internal layer, as Coste supposed, the result is the yellow tint, which may be recognized from without, or, more distinctly, on section. If the laceration has produced an opening of sufficient size, the clot which occupies the cavity may escape along with the ovum; but if not, it is retained and absorbed. The folding of the internal layer now becomes much more distinct, so that the internal surface of the vesicle resembles cerebral convolutions on a minute scale, the whole of the membrane (ovisac) becoming hypertrophied and more distinctly yellow. According to Coste, this plication is due in great measure to retraction of the external coat; but this does not seem by any means clear, seeing that the convolutions become quite as distinct in those cases where the diameter of the whole vesicle is not diminished. In every case the cavity of the vesicle becomes rapidly encroached upon, the furrows between the convolutions become deeper, and the result is that the follicle now presents, in a section, a stellated appearance, which is more or less marked, according to the stage at which the corpus luteum has arrived. The various changes above alluded to are shown in Fig. 41, taken from Coste's Atlas, which represents an actual dissection, made at the Morgue, of the ovary of a young woman who had committed suicide towards the end of a menstrual period.

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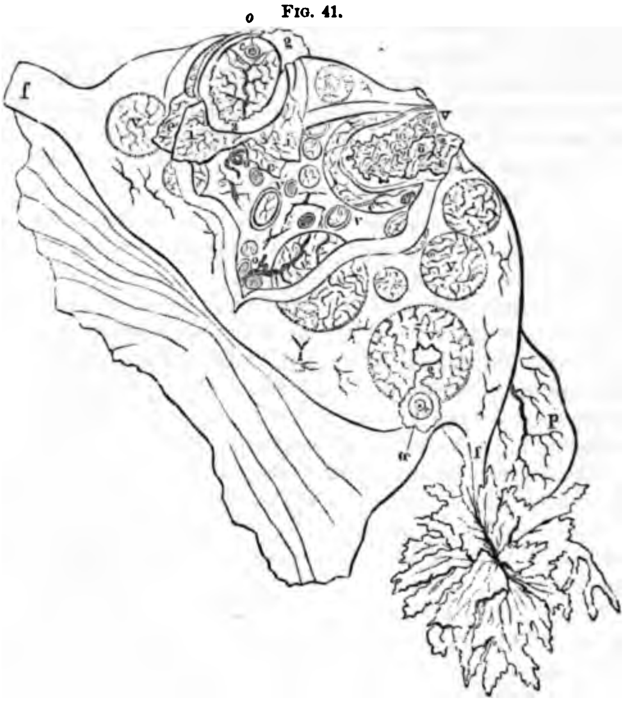
[1] Beweis der von der Begattung unabhängigen periodischen Reifung und Loslösung der Eier, &c. 1844.

[2] See Raciborski, "De la ponte périodique chez la femme et les Mammifères." 1844.

FIG. 41.



Ovary dissected, to show the structure of the Graafian vesicle at various stages.

The ovary is here partly dissected, to show the situation of the ova;

and also the structure of the Graafian vesicles, and the changes which they undergo after rupture. Most of the vesicles are turgid, tending to protrude, and indicated by the network of vessels on their walls. Three of them are open.

1. The vesicle to the left in the figure is intended to demonstrate the following peculiarities:

  g g. The granular membrane, which covers the whole internal surface of the Graafian vesicle.

A thickened portion of this—granular disk—showing:

  o. The Ovum surrounded by the cells of the disk, and situated, as is usual immediately before rupture, on the side next the peritoneum.

  i i. Internal layer of the Graafian vesicle, showing a rich vascular network, not only on the flaps which are turned back, but also in the interior of the vesicle, through the granular membrane.

  e e. External (vascular) layer, vascular like the former.

2. The open Graafian vesicle in the centre of the figure has broken spontaneously at the point *v*, and has allowed its ovum to escape. The nipple-shaped part of the granular membrane, in which the ovum was imbedded, has escaped along with it.

  g. Layer of granular membrane, which has not been dragged out with the ovum.

  i. Internal layer of the Graafian vesicle, forming numerous folds, which are the earliest of the modifications through which this layer passes in the formation of the Corpus Luteum.

  e. External layer of the Graafian vesicle, retracted (*Sic*, Coste) on the former.

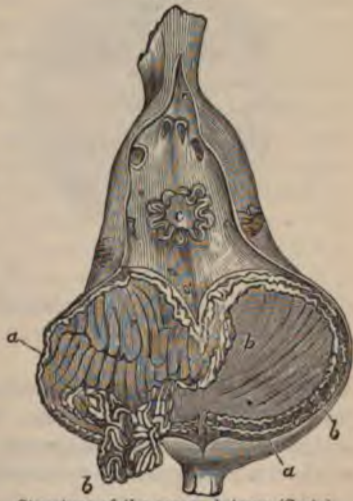
3. The third Graafian vesicle, to the right, has been artificially pierced to show how the ovum, while escaping, drags with it that portion of the granular membrane in which it is lodged.

  g. Portion of the granular membrane, escaping by the opening made in the Graafian vesicle.

  œ. Ovum lodged in the thickened nipple-like projection of this membrane.

Coste denies the presence, as a rule, of a blood-clot within the Graafian vesicle. He asserts that the vesicle, after rupture, becomes filled with a gelatinous matter, which is slightly tinged with the coloring matter of the blood. This he shows in Fig. 42, where the ovary is divided in its whole length to show the organization of the corpus luteum. The preparation was taken from a woman, the mother of several children, who died from poison several days after menstruation. The body was exhumed and examined a week after death. No ovum was found in the uterus, or in the Fallopian tube. An open corpus luteum, of considerable size, is shown in the lower part of the figure.

FIG. 42.



Structure of the corpus luteum (Coste).

a. Internal layer of the Graafian vesicle, plicated, and having commenced that hypertrophy which converts it into corpus luteum.

b. Plastic semi-transparent matter, which occupies the centre of the corpus luteum, adheres intimately to the internal surface of the convolutions, and moulds itself upon them. To the right, this matter is left in its place; on the left it has been detached, to show the subjacent convolutions and the impression which they leave upon it.

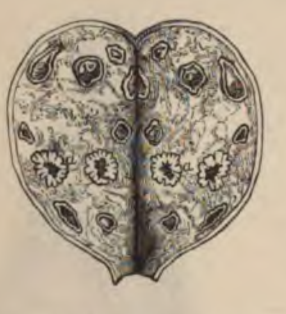
c. An old corpus luteum, from a preceding menstruation,—probably the one before last.

Graafian vesicles,—some intact, others open, and in various stages of development, are seen in other parts of the ovary.

The description given, up to this point, applies to all corpora lutea, whether associated with pregnancy or not. It is therefore scarcely necessary to add that Haller was in error when he stated that "the corpus luteum is the effect of pregnancy alone." The demonstration of this error caused many hastily to assume that the corpus luteum was, under no circumstances, a sign of pregnancy, and was, in consequence, of no medico-legal value,—an unfortunate mistake, which has been productive of much confusion, as there certainly are points of difference which enable us, with care, to distinguish between the two varieties.

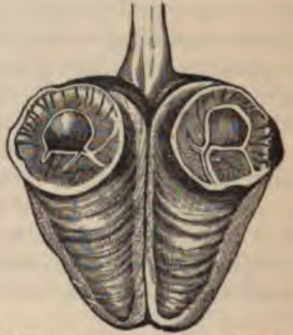
The corpus luteum which is found when there has been no impregnation, runs something like the following course from the point at which we left it. It shrinks rapidly, the retractility of the outer coat being apparently the chief agent in its contraction. The contiguous surface of the convolutions become pressed together, and their free surfaces gradually approach across the cavity, so as rapidly to obliterate the cavity. The vascularity of the vesicle, and of the stroma of the ovary, becomes notably diminished, the ovisac loses its yellow color, and becomes white,—all these changes occurring in about twenty-five or thirty days, so that, on the approach of another menstrual period, the cavity is reduced to about the size of a pinhead. At this stage, its appearance, as represented in Fig. 43, *a*, is very characteristic, the rays which proceed outwards from the central cavity showing the point of junction of the convolutions. Several other vesicles are shown, of the ordinary size before enlargement. From this stage, the stellate remains of the vesicles gradually diminish in size, and retreat towards the centre of the stroma, to give place to others, until at last they are obliterated.

FIG. 43.



The corpus luteum of simple ovulation.

FIG. 44.



Corpus luteum in the third month of pregnancy. (Montgomery.)

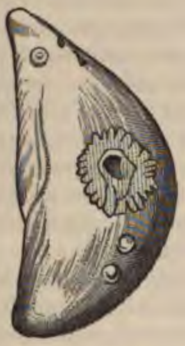
Sometimes, they soften so rapidly, that they are completely reabsorbed before the folds of the internal layer have actually come in contact or contracted adhesions.

Widely different is the state of matters where the ovum has been impregnated. In this case, the functional activity of the uterus is, in a measure, shared by the ovaries, and manifests itself in an increased vascularity, which, instead of disappearing, as at the end of a menstrual period, is maintained, more or less, during the whole course of the pregnancy. It is, probably, in consequence of this, that the corpus luteum of pregnancy goes through a series of transformations, so much more elaborate, and extending over a period the duration of which is so much longer. Taking the duration of an unimpregnated follicle as about two months to complete obliteration, the corpus luteum which accompanies pregnancy may be said to last usually for thirteen or fourteen months, while traces of it may be found at a still later period.

Such a history involves the idea of special structure and modified development, and this a study of the facts amply corroborates. When pregnancy succeeds or accompanies the phenomena of ovulation, the earlier changes are the same as those already described; but instead of softening and rapidly shrinking, as in the former case, the inner coat, or ovisac, continues to develop in thickness, and deepens in color, in consequence of an increase in the number of oil-granules in its substance. There does not seem, in the first instance at least, to be any contraction whatever of the external membrane. On the contrary, there is some reason to believe that, at this stage, it often yields, so as to admit of an increase in the entire diameter of the vesicle, and, indeed, if we admit Coste's description to be correct, when he describes the corpus luteum of pregnancy to be "as large as the ovary itself," this can only be accounted for in the manner described. The size of the ruptured follicle varies considerably, but occupies, usually, during the first four months, about a fourth, a third, or a half of the entire ovary. During the period immediately succeeding impregnation, rapid hypertrophy of the inner coat goes on, and it becomes folded together into convolutions as before. The material being abundantly supplied, while the development still continues, causes the convolutions to be firmly pressed together, while their free surface encroaches upon the cavity. At the end of two months, the condensation of the hypertrophied tissue of the ovisac will be found to have imparted to the follicle a considerable amount of solidity, which is quite obvious when it is pressed by the finger. Bloodvessels run through it, from the circumference towards the centre, marking, probably, the situation of the original folds. These latter are no longer distinct, and are so compressed laterally that the layer has now the appearance of a very thick yellow coat surrounding the diminished cavity, which is up to this time usually circular in form, as shown in Fig. 44.

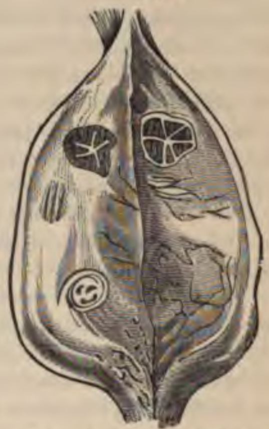
The blood-clot which originally occupied the cavity, or, if we choose to adopt the view of Coste, the tinged lymph which is effused after rupture, undergoes certain metamorphoses, which ultimately result in the formation of a milk-white coat which lines the cavity, taking the place, as it were, of the original granular membrane. This membrane, which is also shown in Fig. 44, is fibrous in structure, and extremely tough. Occasionally, the cavity is obliterated at the fourth month, but generally it will still be found perfectly distinct, although much reduced in size, up to the sixth month of pregnancy (Fig. 45). The walls continue gradually to approach nearer to each other, the white lining membrane becomes thinner, and, folded into plaits, which, radiating outwards, are seen to intermingle with the yellow color of the ovisac. The outer boundary of the vesicle now becomes irregular in outline, and complete obliteration of the cavity ensues, a white stellated cicatrix in the midst of the yellow mass marking where its walls came into contact. This is shown in Fig. 46, the original drawing of which was taken by Montgomery from a woman who had died of inflammation of the uterus two days after mature delivery. Up to this time, and often for some weeks afterwards, numerous vessels radiate through the corpus luteum, as may be proved by injection. This vascularity is now markedly diminished, while, at the same time, the characteristic yellow color becomes fainter in hue. It is often not till four or five months have elapsed, that all trace of the corpus luteum has disappeared, a trace of the tough white membrane being then, it may be, still indicated by a very faint star-like scar in the stroma of the ovary.

FIG. 45.



Corpus luteum at the sixth month of pregnancy. (Montgomery.)

FIG. 46.



Corpus luteum at the period of delivery.

As the facts above set forth are of some medico-legal, as well as obstetric importance, they may be briefly summarized as follows:

What is called the Corpus Luteum is due to a deposit of yellow fatty matter in, and hypertrophy of, the internal layer of the Graafian vesicle (ovisac).

The formation of a corpus luteum always succeeds the rupture of a Graafian vesicle.

Up to a certain point, the changes in the Graafian vesicle are uniform, and have no relation to pregnancy. The corpus luteum of pregnancy may, however, be distinguished in its subsequent course, by its higher development and longer duration, its hardness, its vascularity, and, at a later stage, by the formation of the white lining membrane, and large central stellate cicatrix.

The presence in the ovary of a corpus luteum is no evidence of pregnancy, unless the characteristics above indicated are distinct and unequivocal,—under which circumstances it is a certain sign.

With reference to the above conclusions, it may be remarked that much confusion has arisen from the employment loosely of the terms "true" and "false," as applied to the corpus luteum, in so far as they are assumed to imply a distinction, which proves or disproves the occurrence of pregnancy. "There is as little reason," says Farre, with justifiable emphasis, "for the use of the last term as there would be for denominating a child a false man. . . . . These terms actually represent the same body, only in different stages of growth or decay."

During the whole of the childbearing period of a woman's life, the ripening and dehiscence of the Graafian vesicles are of periodic occurrence. In those animals in which plural births are the rule, several vesicles ripen and discharge their contents at, or near, the same time; but in Man this is exceptional, and we thus find that one vesicle only, as a rule, ripens at a time, bursts, discharges its contents, and rapidly shrinks as it retires towards the centre of the ovary; to give place in their turn, in a normal condition of the parts, to a constant succession of vesicles, which, one by one, run a similar course after discharging their ova.

Although the phenomena of menstruation are undoubtedly associated, in the most intimate manner, with those of ovulation, the observations of Ritchie[1] seem to show that, under certain circumstances,—the nature of which is not well understood,—menstruation may occur without any rupture of a follicle; while, on the other hand, as he believes, rupture of a follicle may occur independently of the excitement of menstruation. Be this as it may, the rule is otherwise; and there is every reason to believe, further, that during pregnancy and suckling, while the uterine functions are in abeyance, those also of the ovary are temporarily arrested, in so far as the development of new Graafian vesicles is concerned,—the whole generative force being, as it were, turned into other channels.

The numerous lacerations which, in consequence of repeated ruptures, take place on the surface of the ovary, leave, in the process of healing, corresponding cicatrices. On this account the smoothness of surface is soon lost, and it becomes more and more fissured and wrinkled, until, towards the end of the childbearing epoch in a woman's life, the ovary is so irregular on the surface, as to warrant the comparison which Raciborski has instituted between it and the kernel of a peach. After this, the organ becomes atrophied, and, like the uterus and other parts, is restored, in some measure, to the form which it presented in early life.

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[1] London Medical Gazette, 1843.

CHAPTER V.

MENSTRUATION AND CONCEPTION.

THE "RUT" OF MAMMALIA: ANALOGY BETWEEN THIS AND MENSTRUATION—THE FIRST MENSTRUAL PERIOD: STATISTICS OF DURATION OF A "PERIOD"—QUANTITY OF THE DISCHARGE—MENSTRUATION A HEMORRHAGE: NON-COAGULABILITY OF—SOURCE OF THE MENSES: VARIOUS THEORIES REGARDING: IS FROM THE MUCOUS MEMBRANE OF THE CAVITY—POUCHET'S THEORY EXAMINED; IS THE MUCOUS MEMBRANE SHED?—VIEWS OF KÖLLIKER, COSTE, ETC.—DURATION OF CHILDBEARING EPOCH—CAUSE OF MENSTRUATION—CONCEPTION—COMPOSITION OF THE SEMEN—SPERMATOZOA AND THEIR DEVELOPMENT—"SPERM CELLS"—THE FUNCTION OF THE GERMINAL VESICLE; "GERM CELLS"—HOW DOES THE SEMEN REACH THE OVUM?

THERE is, in the animal kingdom generally, a certain periodicity in the phenomena which attend the maturation of the Ovum. In the Mammalia, there always is a period of excitement, in which the whole generative apparatus more or less participates; succeeded by a period of rest, of longer or shorter duration, according to the group or species, during which the organs involved are in a state of complete or comparative quiescence. The first marks the period at which the ovum is ready for impregnation; during the latter sexual congress is, as a rule, ineffectual. This term of excitement, which is accompanied by general and local symptoms to be noticed presently, is called, in mammals lower in the scale than man, the *rut* or *œstrus*.

There is not the slightest doubt that, in those animals, the escape of the ova from the ovary, and their passage down the Fallopian tube, are facts which coincide with the œstrus. The female then manifests an instinctive desire for copulation, and is generally said to be at this time "in season" or "in heat." The pudendum is congested and swollen, and the glands in this region pour out an abundant secretion, which, by its odor, attracts the male. This secretion, unless in those animals which come nearest to man in the scale, is very seldom even tinged with blood. In some cases, as was demonstrated by Bischoff in the case of the roe, the rut occurs only at intervals of a year, about the month of August. It is only at this period that the ovaria of the female contain ripe ova; and, what is of even higher physiological interest, the semen of the male is elaborated then and then only, so that impregnation is doubly impossible, save with a view to the birth of the young at that time of the year when they may be most easily reared. But, in many animals, the maturation and dehiscence of the ova occur with much greater frequency, and it is probable that food, domestication, and careful tending, may modify the return of those periods.

In women, during the period of ovulation, there are, as has already been shown, certain essential phenomena which are, so far, almost identical with what we observe in other mammalia. But there is here a special phenomenon superadded, which is in fact the external manifestation of what we know to be taking place internally. This consists in a discharge from the uterus of nearly pure blood, which lasts usually for several days. It is called the "catamenial" or "menstrual discharge," as it occurs very constantly at intervals of a month; the occurrence being, in its course, usually designated as Menstruation.

A very warm discussion has been maintained for many years as to whether the "rut" and "menstruation" are to be held as analogous. Up to a certain point, the analogy is admitted by all; but it must be conceded that, between the two, distinctions and even contrasts are found, on careful examination, to arise, which seem to challenge the truth of the assertion which many have made, that the phenomena are physiologically identical. Without expressing any confident opinion as to this *quæstio vexata*, we may here mention the chief points, in addition to the sanguineous discharge, in which they differ. Impregnation takes place during the excitement of the rut, while as a general rule it occurs in women about a week after menstruation, during the period of rest. Again, there succeeds to the rut a period of inappetence, when not only does the female refuse the male, but in some cases no semen is, as we have seen, secreted; in the human species there is, strictly speaking, no period of inappetence, not even excepting the period of the menstrual discharge, so that at any time impregnation *may* occur. Great as these differences undoubtedly are, and even if we admit that they destroy the identity of the acts, they are scarcely sufficient to warrant us in rejecting the mere analogy; for, although the subject is still obscure, a more accurate knowledge of the time occupied by the descent of the human ovum may show that the above points of contrast are more apparent than real.

Menstruation is familiarly termed by women the "courses," "monthly illness," or "period." It is not to be looked upon as an isolated act, but as one of the important series of phenomena which occur during ovulation; and as such it requires special and careful attention. Its first appearance is associated with the other signs of puberty. The approach of this is indicated by an alteration in the form of the pelvis, and a consequent change in figure and gait; by the growth of hair on the pubes, the rapid development of the mammæ, the greater projection of the nipple, and the deeper color of the areola. These physical modifications are generally associated with very characteristic moral changes. A frank romping manner gives place to one more timid and gentle, and the loud voice and ringing laughter of childhood is replaced by subdued tones and bashful reserve. A Graafian vesicle now for the first time comes to maturity, and projects on the surface of the ovary, which is embraced by the fimbriæ of the Fallopian tube, while the whole of the organs, including the uterus, become highly congested.

According to Boerhaave, the first menstruation is accompanied with a certain amount of fever, as the result of the excitement of the genital organs. The girl complains of lassitude, hypogastric fulness, lumbar and sacral pains, slight itching and tumefaction of the external genitals, and a painful swelling of the mammæ. Not unfrequently, hysteria, chorea, and other nervous disorders, manifest themselves,—generally in a mild form. After a few days, a mucous discharge, more or less abundant, is observed; this becomes tinged with blood, and after a time is found to be almost pure blood, to be again replaced by a tinted, and finally by a clear discharge, closely resembling that which at first showed itself. The previous symptoms disappear with the menses, which may have lasted a week, and she is restored to perfect health, but with an indescribable something in manner and appearance which marks the transition into womanhood. Such symptoms as are above detailed, on the authority of Boerhaave, as accompanying a first menstruation, are generally slight in degree, the discharge often appearing during sleep, or at any other time, without anything whatever of the nature of premonitory symptoms. Very often, for a period or two, some of the same symptoms are experienced, at intervals of a month, without any flow of blood. These indicate preliminary or abortive attempts, on the part of nature,—the Graafian vesicles being, probably, as yet, not perfectly mature; but there is little reason to doubt, that the first maturation of a vesicle is, as a rule, coincident with the first menstrual discharge.

The initiation of this period of a woman's life is believed to be hastened by hot climates, by residence in towns, and the habits which are there contracted, and by constitutional vigor; while cold temperatures, country residence, and a feeble and delicate temperament, retard the act. In a certain number of cases, menstruation is postponed to a period of life much more advanced than usual. We read, for example, of a case in which a woman who had married at twenty-seven, menstruated for the first time two months after her eighth labor; and of another who had no discharge until after her second marriage, at the age of forty. Numerous cases of premature menstruation are also on record, where menstruation has actually appeared during infancy, and where the external appearances and sexual desires of maturity have been manifested at a very early age. In a case cited by Carus, a child menstruated at the age of two years, became pregnant at eight, and lived to an advanced age. Such cases are, of course, extremely rare; but of more frequent occurrence are those instances in which women become pregnant without ever having menstruated; while it is by no means an uncommon thing for a woman who is nursing, to become pregnant again before the menses have returned, such facts, indicating, as Cazeaux observes, that menstruation plays a secondary part in the phenomena of ovulation.

Putting such very exceptional cases aside, as irregular and abnormal, we at once recognize the fact, that the time of a first menstruation varies greatly, according to climate, constitution, and the kind of life which is led. In so far as climate is concerned, the influence exercised by it, while quite marked, is by no means so considerable as was once supposed, and may be represented by a period of three years at the furthest between the extremes, which we may suppose to exist in the Hindoo and the Esquimaux. At one time, ideas were entertained on this subject which more correct observation has shown to be absurd, and to no one are we more indebted than to Mr. Roberton, of Manchester, for clearing away the errors which have been long promulgated on these points. The following table, which shows the period of the first menstruation in 8983 cases, is the result of a very careful analysis of the most reliable statistics which have been published in Europe on this subject.

Some idea is here given of the variation in the different countries of Europe, and shows the very small proportion of cases in which menstruation first appears under ten or over twenty-two years. The period, as will be observed, varies very considerably, about the age of sixteen being the time at which it most frequently shows itself in this country. At any age, however, between twelve and twenty, the function may be established, without any peculiarity whatever in the attendant symptoms or deterioration of the general health; but if beyond these limits, it may be looked upon as exceptional and irregular, although even then, as in the cases alluded to, the health may in no way suffer.

AGE.	ENGLAND.	FRANCE.	GERMANY.	NORWAY.	RUSSIA.	TOTAL.
	Roberton, Lee, Whitehead, and Murphy.	Brierre de Boismont, Raciborski, Bouchacourt.	Osiander.	Faye.	Lebrun.	
Under 10,	14	16	. . .	. . .	. . .	30
10 to 11,	64	41	. . .	. . .	. . .	105
11 " 12,	103	138	. . .	. . .	. . .	241
12 " 13,	278	209	3	4	. . .	494
13 " 14,	695	258	8	4	. . .	865
14 " 15,	1034	355	21	13	1	1424
15 " 16,	1178	411	32	14	15	1650
16 " 17,	1307	349	24	20	27	1727
17 " 18,	714	287	11	13	35	1060
18 " 19,	531	190	18	13	13	765
19 " 20,	213	102	10	6	6	337
20 " 21,	104	66	8	8	2	188
21 " 22,	18	31	1	3	1	54
Over 22,	17	23	1	2	. . .	43
Total, . .	6170	2476	137	100	100	8983

Once established, the menses should return with periodic regularity during the whole childbearing epoch. The recurrence of the discharge is always attended with local, and generally with constitutional, symptoms. The latter are identical with those which accompany the first menstruation, only less in degree, and constitute what has been termed the *menstrual molimen*. The only circumstances which normally arrest this function of the uterus are the occurrence of pregnancy and lactation, during which the ovarian and uterine functions are generally in complete abeyance. If, under other circumstances, it should disappear during the childbearing epoch, it is regarded as an indication of some morbid condition, usually constitutional, and which declares itself as a rule by the presence of other symptoms. It may last from one to eight days, eight being, according to Brierre de Boismont, the most common and, strange to say, seven the least so. The following is, according to the same observer, the duration in days arranged in the order of frequency in which each day is selected:

8 : 3 : 4 : 2 : 5 : 1 : 6 : 10 : 7.[1]

The catamenial period and interval together occupy a period of a month of four weeks, or twenty-eight days. This is the rhythm of the act in such a large proportion of cases, that we may set it down as the rule; but it is a rule to which we find constant exceptions, a few days more or less than the limit here mentioned being of constant occurrence, much greater irregularities, indeed, being quite compatible with perfect health. It is by no means rare to find a woman who menstruates once in six weeks or once in a fortnight, without any inconvenience whatever. In all cases, it is the continuance of the flow which mainly determines the duration of the interval or intermenstrual period. In some, and under the influence of morbid conditions, a leucorrhœal discharge takes the place of the ordinary menstrual flow; and, in others, the molimen is relieved by a discharge of a hemorrhagic nature from some other surface. Both of these conditions, although essentially pathological, are, nevertheless, in not a few instances, beneficial in their action.

The amount of the discharge is very variable even in the same woman, and very different opinions have been formed as to what is to be considered a normal quantity over the whole period. The obvious difficulties in the way of such an investigation have hitherto prevented anything like a reliable estimate. That of Hippocrates, which we have on the authority of Galen, assumes eighteen ounces to be lost at each period, but this has not been confirmed, even proximately, by any modern observer. Meigs puts it down at four to six ounces, Dehaen at three to five, and Farre at two to three; and there can be no doubt that these figures give a more accurate idea, and that Farre is probably correct when he says "that a discharge amounting to six or more ounces in the aggregate, will generally produce for the time sensible effects upon the constitution, such as general pallor, and some feebleness of the muscular system."

In regard to the nature and influence of the menstrual discharge, very incorrect and even fabulous opinions were entertained. Pliny assures us that the presence of a menstruating woman blights vegetation, turns wine sour, and produces a number of other and similar effects; and in some districts, even at the present day, traces of this superstition are to be found. The peculiar odor which was described by De Graaf, and which has been compared by some French physiologists to that of the marigold, is a very usual characteristic of the discharge, but it is scarcely necessary to add that, in the absence of any morbid condition, neither this nor any other quality of the discharge can produce deleterious results. During the height of the period it is composed, as the researches of Donné, Pouchet, Letheby, and others have abundantly proved, almost entirely of pure blood, mixed with a certain quantity of mucus. During the period of invasion and decline, the mucus predominates, the color being in direct proportion to the number of blood-corpuscles, which are seen by the microscope, mixed with epithelial scales and with mucus-corpuscles from the cervix.

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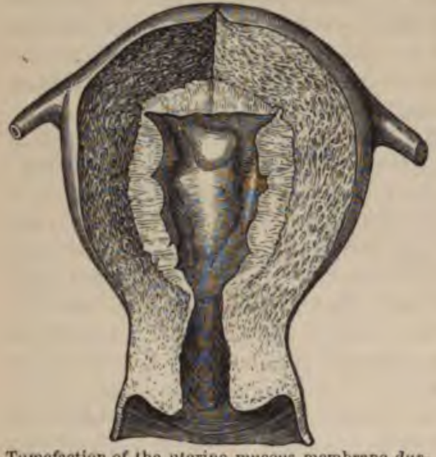
[1] De la Menstruation: par A. Brierre de Boismont. Paris, 1842.

There is one striking peculiarity which serves to distinguish this from ordinary hemorrhagic discharges—its want of coagulability. This was at one time supposed to be of itself sufficient evidence that it was not blood, or was blood deprived of its fibrin; but no doubt now remains that the arrest of coagulation depends upon the mixture of the acid secretion of the vagina with the still fluid blood as it escapes from the os; which not only maintains the fibrin in solution, but also renders it difficult of chemical detection. When the quantity is excessive, constituting the affection known as menorrhagia, nothing is more common than to find clots discharged, the blood being then so far in excess as to neutralize the acid in the vagina. And, besides, it has been proved that if the blood be collected as it escapes from the os, and before it mixes with the mucus, it is coagulable and alkaline in reaction. These facts suffice to prove that the discharge is a hemorrhage.

Source of the Menstrual Discharge.—There are few subjects in physiology which have given rise to more discussion than this. Some observers have seen blood oozing from the surface of the vaginal mucous membrane, while others have traced it to the os and cervix uteri; and on isolated observations such as these, theories on the subject have been founded. Admitting the facts upon which these theories have an unsubstantial basis, we recognize in them nothing more than examples of *vicarious* menstruation, a term which has been applied to those cases in which the menstrual molimen is relieved by a discharge through an unwonted channel. That the menstrual discharge has its true source in the mucous membrane which lines the cavity of the uterus is a fact which admits of no doubt, and has been proved to demonstration, by examination of the uteri of women who have died during a period; by accumulation of blood within the cavity in cases of atresia of the cervix or of the vagina; and, finally, by the examination of cases of chronic inversion of the uterus, which offer peculiar facilities for the study of the subject.

In our review of ovulation, those of the essential phenomena of the process which have their seat in the uterus and its lining membrane, were left for consideration at this place. In point of fact, we may assume that menstruation itself is essentially one of these phenomena, which are mutually dependent on each other. Along with the enlargement of the ovary and Fallopian tubes already described, a very considerable enlargement, involving an increase in weight, takes place in the uterus. Its vascular apparatus becomes developed and injected in an unusual degree. This is especially marked in the case of the mucous membrane, on the surface of which, under the epithelium, the vascular network already described becomes very distinct where the vessels surround the orifices of the utricular glands. The glands themselves are also visibly enlarged, and any difficulty which may arise in demonstrating them while the uterus is at rest, now no longer exists. The membrane becomes increased in thickness, its color is deepened, and the temperature of the whole womb is raised. The result of these changes is that the membrane becomes hypertrophied to such an extent that it is thrown into convolutions, which are soft, pressed together, and project into the cavity so as to fill it completely, its walls being thus no longer smooth but wrinkled. (Fig. 47.) M. Coste, whose conclusions are based upon no inconsiderable number of such observations, says that, save as a pathological product, no such pseudo-membranous exudation exists, as has been described so frequently by physiologists of repute.

FIG. 47.



Tumefaction of the uterine mucous membrane during menstruation. (After Coste.)

A closer examination of the surface shows that, at this period, it is dotted over with minute specks, which a low magnifying power proves to be small drops of blood which occupy the orifices of the utricular glands, from which they may be dislodged by gentle compression of the walls. This, however, does not determine the ultimate source of the hemorrhagic flow, and it is around this part of the subject that great, and almost insuperable difficulties have arisen.

That it is not a secretion, in the proper acceptation of the term, as was once believed, is a postulate which the analysis of the discharge enables us to affirm. We need not therefore address ourselves to the refutation of an exploded theory. The view entertained by Coste, is that it is a transudation through the walls of capillary vessels, chiefly venous, or in other words (if we do not misunderstand him) that a considerable hemorrhage takes place in this manner without any breach whatever in the walls even of the smallest vessels, a conclusion which all physiological analogy forbids us to accept. That there may be permanent vascular orifices through which the blood escapes during the menstrual period is an idea which has found favor in the eyes of some eminent physiologists, among others Dr. Farre. Nor is this so fanciful a view as one might be disposed at first to consider it. If there are permanent orifices, it may indeed be asked, why is there not continuous hemorrhage? And in reply, it may be assumed, hypothetically of course, that these orifices are, during the intermenstrual period, closed by the contractility of the tissues which surround them; but that the increased vascularity, tumefaction, and relaxation of all these parts, which coincide so constantly with the other phenomena of ovulation, admit of a welling forth of pure blood through apertures which now, under the special circumstances, become patent, and which, the apogée of the period having passed, forthwith commence to close, to open afresh on the approach of the next menstruation.

The theory, however, which perhaps of all others has attracted in recent times the greatest amount of attention, is that which is associated chiefly with the name of M. Pouchet, a very distinguished and able physiologist, although one who is rather addicted withal to jumping at conclusions. To this theory some of the ablest of our English writers have given their adhesion. Pouchet supposed that the whole, or the greater part of the mucous membrane (not the epithelium merely) is shed at each catamenial period; and that its separation from the subjacent tissues involves the rupture of vessels, whence the menstrual flow. This, however, would involve, as will at once be noticed, a very different appearance of the internal surface of the uterus, from that which has been above described as occurring at this time, and which we believe to be substantially correct. A separation of a membrane so thick and so important as this, would, in fact, be capable of obvious anatomical demonstration; and if it could be so demonstrated, we would at once have, in the trunks of the vessels which must of necessity be ruptured, the source, clear and unequivocal, which we are endeavoring to trace. The separation of the whole mucous membrane of the uterus, under the name of *decidua*, which always occurs as we shall see in women at the moment of delivery, and the occasional occurrence of what is known as membranous dysmenorrhœa, when, in certain morbid conditions, the whole membrane is actually exfoliated, and shed either piecemeal or entire, are facts which have seemed to M. Pouchet sufficient to establish an analogy, on which, mainly, his theory is based. The mucous membrane, he says, is deciduous not merely at the termination of pregnancy, or as a consequence of an exceptional morbid action, but at each menstrual period. No such separation takes place in the lower animals, and in this distinction we find revealed at once the source of the menstrual discharge, and the reason why, in the human species, hemorrhage is superadded to the ordinary phenomena of "rut." Ingenious as this theory may be, and interesting as the facts undoubtedly are which its promoter has brought to bear upon it, it is one, we think, which does not bear well a closer investigation.

If M. Pouchet could show us the exfoliated membrane, and the raw, bleeding surface which its removal necessarily involves, as he might do in membranous dysmenorrhœa, or in women who have died shortly after delivery, his theory would be established, and the question forever set at rest. But in this he has completely failed. Opportunities of examining the bodies of women who die during a menstrual period are, no doubt, rare; but a sufficient number of such examinations have been made by Coste, and by others who, like him, have faithfully and elaborately recorded their results, to show what is the usual condition of the parts. In a certain number of cases, no doubt, partial or complete exfoliation does occur, but even Pouchet himself is forced to admit that these cases are exceptional. But what does he do now? He propounds, *more suo*,—a new theory, according to which the membrane is held to desquamate, not during menstruation, but in the interval. In doing so, he necessarily abandons all the advantage which he gained from the analogy which he so ingeniously established. For there can be no comparison between a desquamation occurring when the functional activity of the womb is in abeyance, and one which is uniformily associated with its highest function; although an analogy might fairly enough have been traced between the birth of the decidua, in the final act of parturition, and the shedding of the same membrane in connection with a process which is held to be, up to a certain point, preparatory to the reception and development of the ovum.

The separation of the membrane from the subjacent structures would certainly, if occurring during menstruation, account satisfactorily for the discharge; but, even if it were established that an intermenstrual exfoliation did occur, this would in no sense whatever account for the periodical phenomena of menstruation. Dr. Tyler Smith states, that, having had several opportunities of examining the uteri of women who had died during menstruation, he found that the appearances presented were similar to those which are observed after abortion. "In each of those cases," he says, "I found the mucous membrane of the body of the uterus either in a state of dissolution, or entirely wanting." In one case—of which he gives a drawing in his "Manual"—he found that "in the cervical canal the mucous membrane was perfect, but at the os uteri internum it ceased as abruptly as though it had been dissected away with a knife above this point. Blood was oozing at numerous points, from broken vessels in the submucous tissue." In a microscopic examination of this case, in which he was assisted by Dr. Handfield Jones, no traces of the epithelium or utricular glands could be found. Now, if Dr. Tyler Smith founds his belief on the exfoliation theory, on such cases as this, he goes much further than Pouchet himself, in attempting to prove, what that physiologist does not, that the separation of the membrane occurs *during* menstruation. Speaking with that respect for his views to which such an eminent observer is entitled, we are inclined to assume that Dr. Tyler Smith was mistaken, and that the case was either a very exceptional one, or that he mistook shedding of the epithelium for separation of the entire membrane.

We believe that, in all probability, the views of Kölliker, which have been recently, in some degree, confirmed by Robin, point to a more correct conclusion than any of the theories above stated. These distinguished histologists believe, with Coste, that the mucous membrane becomes thickened during menstruation. They hold, however, that the blood escapes from ruptured superficial capillaries, the epithelium covering the mucous membrane of the body being, in great part, thrown off. The interesting observations of Robin, as to the structure of the utricular glands, make it more than likely that a considerable portion of the discharge comes from these; but that it comes from the surface of the membrane as well, and probably, to a trifling extent, from that of the Fallopian tubes, we may consider as certain. There can be little doubt, however, that a certain change does take place in the epithelium during menstruation. Independent observers have shown, for example, that, as during pregnancy, so also at this time, the epithelium is deprived of its vibratile cilia. Farre has occasionally observed, in an injected uterus, that the capillary vessels, which form so fine a network upon its inner surface, are "denuded and hanging forth in detached loops." Such observations as these, taken along with the fact that epithelial cells, and a certain amount of débris, are found mingled with the catamenial discharge, suffice, we think, to prove that, during menstruation, the flow of blood is from the mucous membrane of the cavity, and that certain changes in, and probable loss of the epithelium, are associated with the flow. As regards the manner in which individual blood-corpuscles escape from the tubes in which they are contained, we must be content for the present to remain, in a measure, ignorant, as none of the theories hitherto advanced have, up to this time, been proved to be correct.

The menstrual, or childbearing epoch of a woman's life, ranges on an average from twenty-five to thirty years, ceasing between the ages of thirty-five and fifty. So long as the woman enjoys perfect health, the appearance of the discharge should be at regular intervals, of which the normal duration is twenty-eight days. Many women, however, as is well known, menstruate every three or every six weeks, and we are only justified, practically, in looking upon such cases as abnormal, when the general symptoms are such as to call for interference. Irregularities occur, too, as we have already seen, frequently enough during the first months of menstruation; and we find also that, as the catamenial climacteric or change of life approaches, the cessation of the menstrual function does not occur abruptly, but after marked premonitory symptoms. At this period of her life, a woman becomes subject to many hysterical and other minor ailments, from which she may previously have enjoyed an entire immunity. A period may, possibly for the first time, pass without discharge. On the next occasion, an increased quantity seems as it were to compensate for the omission which nature had made. Intervals of longer duration may now succeed, intervals which bear no relation to former menstrual epochs, until after a certain number of fitful and capricious efforts on the part of the uterus to relieve itself as before, the catamenia finally cease; the uterus alters its condition to that which it presented in early life, and the ovaries shrink so rapidly, that they become wrinkled in their external surface, so as to resemble, as Raciborski says, the kernel of a peach. The only normal exceptions to regular menstruation are pregnancy and lactation, but even these are by no means regular in their occurrence, as we occasionally meet with cases where women continue to have their periods for some time after conception, and frequently with others where, during lactation, menstruation goes on with perfect regularity. Any menstrual irregularity, however, occurring during that period of a woman's life which we are here considering, and independent of pregnancy, is to be looked upon as an abnormal state, which calls for treatment with a view to the maintenance of her health. These, and other menstrual disorders, constitute a class of diseases to the treatment of which the physician has constantly to address himself.

The cause of menstruation is a question which has given rise to a great deal of useless discussion, and to not a few baseless theories.

Without broadly asserting that the two phenomena stand to each other in the relation of cause and effect, we are, in the present state of our knowledge, entitled to assume that the periodical discharge depends upon corresponding changes in the ovary, associated with the maturation of a Graafian vesicle. This is proved by the examination of the ovaries of women who have died during menstruation, when the appearances already described are almost invariably to be found; by the invariable and immediate cessation of menstruation when the ovaries have been removed;[1] and by the facts which a careful examination of the phenomena of the "rut" of the lower animals discloses. Why the act should recur at periods so regular and constant, is a question which we need scarcely attempt to answer. That, in one animal, a single Graafian vesicle should come to maturity each month, in another, a cluster ripen simultaneously, and, in a third, that ovulation should occur at intervals of a year, are facts which display a marvellous accordance with the purposes of nature in regard to the propagation of species, but they are facts, too, the ultimate *cause* of which will continue to baffle the speculation of the astutest intellects.

Conception, fecundation, and impregnation, are terms all of which imply fruitful contact of the male and female elements, so that a new organism comes into existence. The fecundating principle which is contributed by the male is secreted by the testes at the age of puberty, and is known as the semen or seminal fluid. At the time of sexual contact, the excitement of the erectile tissue is such, that, acting through the medium of a ganglionic centre, which is supposed to be situated in the lower portion of the spinal cord, it culminates in an orgasm, during which certain muscular fibres are called into a reflex and convulsive action. The semen is thus ejaculated with considerable force by the fibres of the vasa deferentia, and by the special muscles which surround the vesiculæ seminales and the prostate gland, its regurgitation towards the bladder being prevented, according to Kobelt, by the tumefaction of the verumontanum which occurs during the period of erection. It is thus thrown for the most part into the upper part of the vagina, and over the os and vaginal portion of the cervix; but it is well known to medical jurists that this, although highly favorable to impregnation, is not essential. On the contrary, there are perhaps few physicians of experience who have not met with cases where women, believing themselves *safe*, have permitted a certain amount of sexual contact without penetration, and have thus become pregnant. All, in fact, that seems to be essential is contact of the seminal fluid with the pudendum, which is further proved by observations of pregnancy coincident with perfect hymen.

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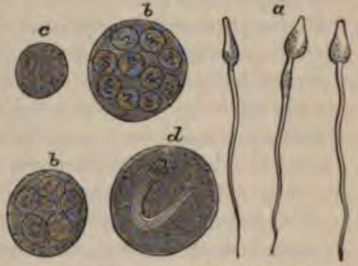
[1] Percival Pott's well-known and often-quoted case is of itself pretty conclusive proof of this fact. "A woman," writes he, "had in the groin two small tumors, so painful that they entirely prevented her from walking. . . . . . After incising the skin and subcutaneous tissues, a membranous sac was discovered, containing a body which resembled the ovary. It was ligatured and incised, and the same was done on the other side. This woman recovered, but her courses, which up to that time had been perfectly regular, never reappeared. The breasts, previously largely developed, became wasted, and she became much thinner and at the same time more muscular." A similar case has been recorded by Cazeaux and another by Dr. Oldham. These cases, and certain historical facts as to the practice of castration of women, in ancient and modern times, prove that menstruation depends upon the existence and condition of the ovary.

The semen is a thick, glutinous, whitish fluid, albuminous, heavier than water, and emitting a peculiar odor. If subjected to examination by a considerable magnifying power, it is found to consist of a number of little oval, flattened bodies, which in man are not more than $\frac{1}{8000}$ of an inch in width, furnished with long filiform tails, which taper gradually to the finest point. A lashing undulating motion is imparted to these bodies, for a certain time after death or ejaculation, varying according to circumstances from several hours to several days. This brisk and constant movement, which has led Kölliker to compare them to ciliated cells, gave rise to the erroneous opinion that they were animalcules—hence the name which they still retain, *Spermatozoa.* Besides these bodies, there are observed certain minute round and granular masses, varying in number, but always fewer in ripe semen than the Spermatozoa themselves. These are what were originally termed by Wagner, "seminal granules," but which have been shown by his subsequent researches, and by those of Kölliker, Leuckardt, &c., to be cells within which the Spermatozoa are developed, and are now termed *vesicles of evolution.* These again are generally found to be inclosed in groups of from three to seven within parent cells (Fig. 48, *b b*), but each vesicle of evolution is destined for the development of a single spermatozoon, as is shown in a mature specimen at *c*. The individual spermatozoa escape thereafter by rupture of the containing vesicle, and may now (*a*) exhibit their characteristic movements. Sometimes, rupture of the vesicles of evolution takes place without absorption of the parent cell, when the appearance produced is that shown at *d*, where a bundle of spermatozoa is seen, their number corresponding to that of the original vesicles. It is only, it may be observed, by a careful examination of the semen in the testes, epididymis, and other portions of the tract, that these several stages may be traced. These elements of the semen are found to float in a limited quantity of clear perfectly homogeneous liquid. Direct experiment on the ova of the Amphibia has proved that it is in the spermatic particles and not in this fluid that the fecundating principle resides. If the spermatozoa are absent, therefore, as in debility, disease, or old age, impregnation is impossible, and it is their absence in the semen of hybrids that renders these animals sterile.

FIG. 48.



Spermatozoa and vesicles of evolution.

The Ovum, at the stage at which we left it, was escaping, or about to escape, from a ripe Graafian follicle. It is then composed of the following parts (see Fig. 39, p. 77):

a, Of a thick transparent membrane, which completely surrounds it, and exhibits no trace of vascularity—the *zona pellucida* of Baer, or *vitelline membrane* of Coste:

b, Of a granular *yolk* contained in this vesicle:

c, Of the *germinal vesicle* of Purkinje:

d, Of the *germinal spot* of Wagner.

The Germinal Vesicle, as the period of dehiscence approaches, moves, as we have seen, towards the periphery of the yolk, both it, and the germinal spot within it, being so placed, as to be as near as possible to the point where rupture is about to occur, as if to seek the fertilizing influence of the male. Since Bischoff actually demonstrated the presence of spermatozoa on the ovaries of bitches and rabbits, in whom congress had been permitted at the proper period, few physiologists attempt to question the possibility of impregnation occurring while the ovum is yet in the ovary; and, indeed, before this discovery was made, the occasional occurrence of ovarian pregnancy was in itself sufficient to warrant such a conclusion. It has been generally assumed, however, that a rupture of the walls of the Graafian vesicle could alone permit of such impregnation; but if we may so far judge from analogy, what has recently been divulged in reference to the penetration of the walls of bloodvessels by the white corpuscles of the blood, and their consequent transformation into pus-cells, we may at least admit the possibility that particles endowed with such mobility may penetrate the attenuated walls of a Graafian vesicle, even before rupture.

The germinal vesicle has been designated by some physiologists the *germ cell*, and the vesicle which contains the spermatozoon the *sperm cell*, it being assumed that the fertilizing product of the latter made its way through the walls of the ovum, and intermingled with the contents of the former. In the osseous fishes, and in some animals lower in the scale, it has been shown that a minute opening (*micropyle*) exists in the zona pellucida, which has been supposed by Dr. Allen Thomson to facilitate the fecundation of ova possessed of very thick external coverings. No reason other than this exists for the belief, which some have entertained, that a similar aperture in the mammalia facilitates the introduction of the spermatozoa. There are many reasons for believing that the germinal vesicle, or germ cell, plays an important part in conception, but what precise share it takes in the process is hitherto undetermined. Barry believed that the germinal spot gave origin to a number of secondary cells, which ultimately became transformed, on impregnation, into the first trace of the embryo. Some more modern researches seem to confirm this theory, and point to the conclusion that these cells escape from the germinal vesicle by rupture of its walls, carrying the fertilizing influence into the yolk, and laying the foundation of the changes which we shall trace. Mr. Newport believed that the rupture of the germinal vesicle was a preparation for, and not a consequence of impregnation.

The cessation of the characteristic movements of the spermatozoa marks the termination of the period during which their fertilizing influence may be exercised. The duration of the period will, therefore, obviously depend upon the circumstances under which the semen is placed. Its admixture, at the time of ejaculation, with the prostatic fluid and the secretion of Cowper's glands, and, subsequently, with the vaginal and uterine secretions, are obviously circumstances which tend to preserve the spermatozoa, by furnishing a medium in which they may freely float: an absence of these conditions would necessarily curtail their vitality. Although we may assume it as an established fact that impregnation *may* occur in the ovary, it by no means follows that it can occur nowhere else. But it is certain that the contact between the male and female elements must almost always take place, if not in the ovary, at some point between it and the upper third of the uterine cavity. Bischoff affirms that, by the time the ovum reaches the lower end of the Fallopian tube, its capacity for impregnation is lost, and experiments which have been made, by tying the Fallopian tubes in the lower animals before copulation, so far corroborate this view.

How, then, do the spermatozoa reach the ovum? It cannot for a moment be doubted that the spermatozoa must make their way upwards in Man, as in the lower animals, from the vagina, to that point where they meet the ovum.[1] This movement may be effected by various agencies: 1st. By the motion of the spermatozoa themselves, which may undoubtedly determine a motion, although it is difficult to conceive why such motion should be in a definite direction. It is highly improbable, therefore, that this is the sole motive power. 2d. By the action of the vibratile cilia. This will account, no doubt, for the movement from the middle of the cervix upwards, but in cases where impregnation has resulted from contact without penetration, the absence of cilia between the vulva and the cervix must leave the movement along this part of the tract to the operation of some other agency. 3d. Muscular peristaltic contractions may also act by propelling the semen in a definite direction. There are various parts of the course which the semen must traverse, to which one or other of these forces may be more applicable, but it is more than likely that all these act more or less in unison, with a view to securing the contact, without which no conception may possibly occur.

The absence of the vibratile cilia during a menstrual period may raise a difficulty as to the acceptance of one of the above theories, most likely to suggest itself to those who entertain the strongest views as to the identity of the rut and menstruation. But, in regard to this, it must be observed, that the period at which impregnation is most likely to occur is immediately before, or some days after, menstruation; in the one case, the changes in the epithelium of the uterine mucous membrane not having yet commenced, and, in the other, a sufficient period having elapsed to admit of its reparation. Another channel through which, in exceptional cases, the spermatozoa may work their way up, is one which, on the authority of Mauriceau, De Graaf, and Baudeloque, Cazeaux assumes to result from a bifurcation of the Fallopian tube near its uterine extremity, the new canal passing through the uterine walls, and opening near the internal os. As modern anatomists make no mention of such a canal, we may assume its existence to be doubtful;

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[1] Some speak of the "ovum" only after impregnation, and term it "ovule" prior to this.

and even if we admit it, its only physiological importance would be the possibility of the arrest of the ovum there, and the formation of what has been called by the older writers "Graviditas in substantiâ uteri."

A sketch of the development of the ovum, from the period of impregnation onwards, will be reserved for the following chapter.

CHAPTER VI.

DEVELOPMENT OF THE OVUM.

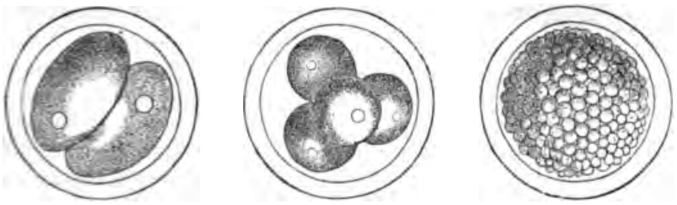
FORMATION OF THE EMBRYO-CELL—CLEAVAGE OF THE YOLK—DEVELOPMENT OF THE BLASTODERMIC VESICLE—"SEROUS" AND "MUCOUS" LAYERS—THE AREA GERMINATIVA AND PRIMITIVE TRACE—FORMATION OF THE EMBRYO; OF THE UMBILICAL VESICLE AND OMPHALO-MESENTERIC VESSELS; OF THE AMNION; OF THE ALLANTOIS AND UMBILICAL VESSELS; OF THE CHORION—THE LIQUOR AMNII—THE VITRIFORM BODY—THE DECIDUA; WHAT IS IT?—DECIDUA VERA; REFLEXA; SEROTINA—EARLY CONNECTION OF OVUM WITH DECIDUA—THE UMBILICAL CORD: VESSELS: GELATIN OF WHARTON, ETC.—KNOTS ON CORD—THE PLACENTA—IN BIRDS; IN NON-PLACENTAL MAMMALS: IN RUMINANTS: IN MAN: MATERNAL AND FŒTAL SURFACES OF: MATERNAL CIRCULATION IN: CURLING ARTERIES: SINUSES: VEINS—FŒTAL PORTION: ARTERIES: TUFTS OR VILLI: VEINS—FUNCTIONS OF THE PLACENTA—STRUCTURE OF VILLI.

THE development of the ovum in the Mammalia, and especially in Man, is, as regards its earlier stages, a subject still involved in no little obscurity. The magnificent results which have sprung from the studies in comparative physiology, associated with the names of Bischoff, Kölliker, Allen Thomson, Rathke, and many others of scarce inferior merit, enable us, with a certain amount of confidence, to fill up gaps in an account of human development, which the very rare opportunities afforded of examining human ova would probably never have revealed, but which the application of strict analogical reasoning enables us to supply. On these principles the following sketch is based. No attempt will, however, be made to follow the development of individual organs; but merely to indicate, in what appears to the writer to be the simplest possible manner, the mode in which the envelopes of the embryo are evolved, and the provision which, in successive stages of growth, is made for its nutrition.

The disappearance of the germinal vesicle is one of the earliest changes which has been observed, but this is not necessarily associated with impregnation. The formation, however, in its place, of the new *embryo cell*, which, having been demonstrated in many animals, is assumed to take place also in the human species, and the changes which immediately occur in the yolk, are undoubted results of the fecundating process, and of the penetration of the walls of the ovum by the spermatozoa. In the outer half of the Fallopian tube, the ovum is believed to have already undergone some of these changes. There can be little doubt, at least, that, even thus early, the germinal vesicle and its spot can no longer be distinguished, and the external surface of the ovum is still covered with some of the granulations in which, within the Graafian vesicle, it was imbedded. The zona pellucida is somewhat thickened, and the embryo cell is probably formed. The yolk becomes more compact, and, as it were, condensed. In the inner half of the tube the granulations have disappeared, and their place is occupied, on the external surface of the ovum, by a thin albuminous layer, which is analogous to the white of the egg in birds. This albuminous layer, like the subjacent zona pellucida, becomes, in the first instance, thicker, and there now commences that most remarkable series of changes preparatory to the formation of the embryo, known as the *segmentation*, or *cleavage of the yolk*.

The first step in this process consists, as is shown in Fig. 49, of the fission of the mass of the yolk into two equal portions, by a deep furrow on either side, which ultimately, by uniting in the centre, completes the division. These again, by a repetition of the process, become subdivided, so that four spheres are now observed to occupy the cavity of the zona pellucida. Each of these divisions of the yolk proceeds, *pari passu*, with a corresponding duplication of the "embryo cell," already referred to. After precisely the same fashion the spherules become still further subdivided into 8, 16, 32, 64, and so on, until, on the arrival of the ovum at the uterine extremity of the Fallopian tube, the yolk presents the appearance shown in Fig. 51, which has been well compared to a mulberry. It is from this *germ mass* that the whole organization of the embryo is gradually evolved. Professor Owen is of opinion that the whole of these cells are not used up in the development of the individual, but that a certain number are retained for the formation of the ovaries or testes, and that, low in the animal scale, as in the Amphibia, special provision is also made, from this source, for the reproduction and repair of limbs which have been injured or lost. The albuminous layer, which has become of very considerable thickness, is now gradually absorbed, and ultimately disappears.

FIG. 49. FIG. 50. FIG. 51.

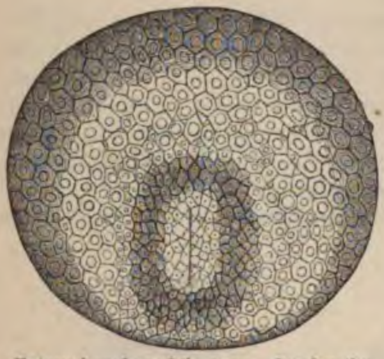


Successive stages of the cleavage of the yolk.

Having arrived in the uterine cavity, the ovum, on examination, appears as if the whole of the granular germ-mass had been absorbed. And to some extent, no doubt, a process of solution or absorption has taken place, the centre of the cavity being again occupied by a fluid which is limpid and transparent. A more careful examination shows, however, that a large proportion of the granules become condensed towards the inner surface of the zona pellucida, assuming the form of true cells, of a hexagonal or pentagonal appearance from the pressure which they exercise upon each other. While these changes are going on, a rotatory movement of the yolk takes place, during which, possibly by centrifugal attraction, the cells retreat from the centre towards the circumference, and ultimately form a new membrane. This spheroidal vesicle within the zona pellucida, is the structure out of which, step by step, the entire embryonic structures are evolved. It is the *blastodermic vesicle* of Bischoff and Coste.

From the shape of the cells of which it is originally composed, the ovum now presents the appearance shown in Fig. 52, which indicates also a considerable increase in size, owing to the rapid augmentation of its fluid contents by absorption from the uterus, and the simultaneous development of the blastodermic vesicle, which now exhibits great and independent vital energy. At one point of its surface a certain number of the original segmentary masses and cells form, by their aggregation, the appearance which is represented in the same figure. This, which is at first round, and subsequently becomes oval, is recognized by its whitish opaque appearance. It is called the *area germinativa*, and constantly increases in size by the development of fresh cells, and by and by splits into two layers, a division which rapidly extends throughout the whole blastodermic vesicle. The external of these two layers was originally called the "serous," the internal the "mucous" layer. As our object is to enter upon this subject, only in so far as is essential to a knowledge of the points in development which are of special obstetric interest, we shall here refer to these two layers only. There is another layer, however, intermediate between the two, which further subdivides as evolution advances, a knowledge of which is essential to a thorough description of the various organs. This was first called the "vascular" layer, but there are many points in reference to it which are still under consideration, and in a measure involved in obscurity. This seems to us to be an additional reason why, at the risk of trifling inaccuracy here and there, we should not enter upon the difficult subject of the intermediate layer.

FIG. 52.



External surface of the ovum, showing the area germinativa.

The Area Germinativa, at first homogeneous in appearance, soon shows in its centre a clear space, called the *area pellucida*, bounded by a denser layer of cells, which are manifestly more opaque. The first appearance of definite embryonic structure is a shallow groove lying lengthwise in the area pellucida. This is the *primitive trace*, the earliest indication of the cerebro-spinal canal. If viewed in section, this groove

(Fig. 53 *a*) is seen to lie between two lateral eminences called the *laminæ dorsales* (*c c*) which we here demonstrate, as it illustrates a law in development, of which, in the evolution of special organs, we find many illustrations. This diagram, after Carpenter, is the only one in the series in which the middle layer is indicated, showing at *o* the first trace of the vertebral column, and at *p p* the subdivision of this layer, indicating the origin of the pleuro-peritoneal cavity. The lowest in figure, is the mucous layer. In the development of the tube of which the groove is the trace, the laminæ dorsales rise, and, folding together, meet in the middle line and there unite. Consequently, the cutaneous or corneal layer (*Hornblatt* of Kölliker) secretes from a portion of its surface, elements which, within the tube, ultimately become the cerebro-spinal nervous centre. Among other instances of this method of development by involution, the formation of the lens and vitreous body, in the construction of the eye, is a striking example, both the skin and these structures being originally portions of the same external or corneal surface.

FIG. 53.

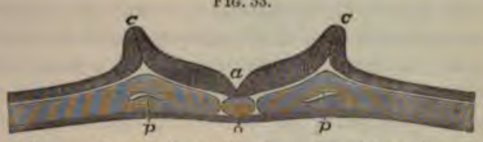


Diagram showing the earliest formation of the embryo.

The albuminous layer having now disappeared, and the zona pellucida having in great part lost its thickness, the formation of the embryo becomes more distinctly manifested by a rolling or folding inwards both of the sides and of the extremities of the area germinativa. At this stage, the embryo has the appearance of a curved gutter, with a larger (cephalic) and a smaller (caudal) extremity. A glance at the diagram (Fig. 54) will show that its external or epidermic surface is continuous with the external or serous layer (*s*) of the blastodermic vesicle. About this period, the blastodermic vesicle becomes divided

FIG. 54.

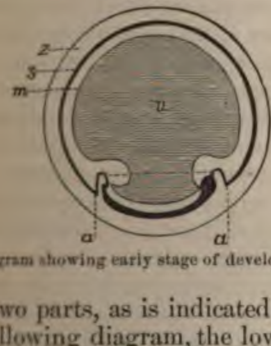
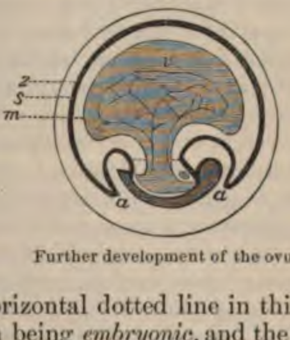


Diagram showing early stage of development.

FIG. 55.



Further development of the ovum.

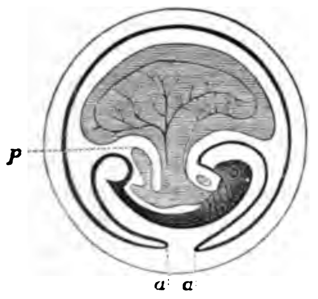
into two parts, as is indicated by the horizontal dotted line in this and the following diagram, the lower portion being *embryonic*, and the large cavity above forming the *umbilical vesicle* (*u*). The embryonic portion constantly increases, while the umbilical vesicle progressively diminishes, as if the development of the former took place at the expense of the latter: this is made clear in the series of diagrams. The two small projections (*a a*) show the earliest stage of the formation, by a process of involution, of the *amnion*, an important fœtal structure, the development of which will be traced presently. The blastodermic vesicle, then, is surrounded by the zona pellucida *z*. It is itself composed of two layers, the external or serous (*s*), which is continuous with the external surface of the embryo, and from which the amnion is developed; and the internal or mucous (*m*), which subsequently subdivides as we have seen. If we look, however, at the mucous layer, in its original and simplest form, we may assume that the umbilical vesicle and the intestinal surface of the embryo are identical and continuous, both being derived from the same layer.

In Fig. 55, the same parts are shown in a more advanced stage of development. The embryonic portion of the blastodermic vesicle is more defined, and of larger size, and the umbilical vesicle is diminished in a corresponding degree, while the communication between the two is rendered more distinct. The first indications are now shown on the latter of a vascular system. This is the *omphalo-mesenteric* system, or circulation of the yolk, from which is formed ultimately the portal circulation of the fœtus. The umbilical vessels spring, as we shall see, from another source. The amnionic folds (*a a*) are now seen to project more over the embryo.

The next step in the process of development is shown in Fig. 56, in which the whole ovum shows an increase in size. The amnionic folds project so far, that they are nearly in contact, the embryo being thus inclosed in a sac, which has as yet an opening at *a a*. About this period, a very important structure, the *allantois*, makes its first appearance under the form of a small pear-shaped vesicle (*p*), which springs from the mucous layer, near the caudal extremity of the embryo. This little organ has, as we shall find, a most important part to play in providing an apparatus, and channel of communication, whereby the circulation and respiration of the fœtus may be efficiently maintained. This vesicle, in Birds, reaches a very considerable size, so much so as completely to surround the yolk-sac, so that, through the shell and its membrane, it comes into actual relation with the external air. In those mammals, in whom the placenta (an organ to be hereafter described) surrounds the ovum, the allantois has in like manner a considerable development; but, in the human race, where its function, though not less important, may be said to be comparatively of a temporary nature, it never reaches any considerable size. It is originally hollow, and is the receptacle for the secretion of the Wolffian bodies, and subsequently for that of the true kidneys when formed. It is not, however, correct to suppose that it gives origin to the urinary bladder, but its pedicle, the *urachus*, forms the suspensory ligament of the bladder, and may be traced in adult life. At a very early period of its formation, vessels make their appearance upon it, and shortly after this (probably in a few days) it becomes elongated and, as it were, *projects* these vessels, which are the umbilical arteries and veins, towards the surface of the ovum, with which it comes into contact at that part where the placenta is about to form. It is not, indeed, until this has taken place that the outer of the two fœtal envelopes may properly be said to be completed.

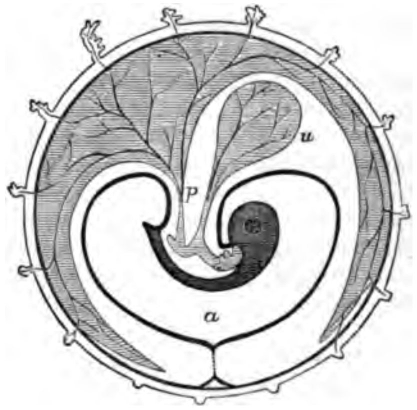
The fœtal covering here alluded to is the *chorion*, which may thus be considered as composed of the external or serous layer, with the remains of the zona pellucida on its external, and some portions of the allantois on its internal surface. The Chorion, thus constituted, becomes abundantly supplied with vessels from the allantois, which soon pervade it in its whole extent, as is shown in the accompanying diagram (Fig. 57). Prior to this, small projections have appeared on the external surface of the chorion, which are the rudiments of the long shaggy *villi* with which the ovum is seen to be covered in abortions occurring in the early weeks of pregnancy. The allantois having now fulfilled its function, dwindles to a mere cord, within which a minute vesicle may be detected by careful examination, as representing the original cavity. It is probable that the allantois forms about the tenth day after impregnation, and runs its course in a few days more; so that it is not to be wondered at, that some physiologists have doubted its existence in the human race, seeing that it has never been demonstrated. Analogy, however, enables us confidently to assume that, without it, there could be no vascularity of the chorion, a condition which would involve a speedy arrest of development. At first, it carries two arteries and two veins; but the vein of the right side becomes obliterated about the fifth or sixth week, so that there are found from this period till the time of birth, two umbilical arteries and one umbilical vein.

FIG. 56.



Development in a more advanced stage.

FIG. 57.



Completion of the amnion, and formation of the umbilical cord.

After the formation of the allantois, the umbilical vesicle rapidly shrinks, and is often seen, in abortions at the sixth week, under the form of a vesicle no larger than a pea, connected with the embryo by means of a long and narrow pedicle. (See Fig. 71.) The omphalo-mesenteric vessels atrophy, along with the organ to which they belong, and the communication which existed between the vesicle and the alimentary canal, becomes more and more curtailed, and ultimately obliterated. There can be no doubt, however, that in the earliest stages of the development of the ovum, and up to the period of the formation of the allantois, the embryo derives its chief nourishment from the whitish yellow fluid which is contained in the umbilical vesicle, and which has been found to contain numerous fatty cells and globules. But with the formation of the allantois and the vascularity of the chorion, the necessity for nutrition from this source ceases, and the umbilical vesicle, which at one time formed the greater part of the bulk of the ovum, now withers, and ultimately disappears.

In proportion to this dwindling of the umbilical vesicle is the rapid development of the *amnion*. In Fig. 57 the completed process of involution, which results in the formation of the cavity of the amnion, is shown, as are the earlier stages in the preceding diagrams. The amnion thus forms a cavity (*a*), in which, henceforth, the fœtus floats freely, protected, by the fluid which it contains, from shock and external influences. By the absorption of the original amnionic folds, at the point where they come into contact (see the dotted line below *a*), the amnion becomes completely detached from that portion of the serous layer of the blastodermic vesicle which we have shown to enter into the formation of the chorion. The amnion thus forms a sheath for the umbilical cord, and from the margins of the ventral aperture, or umbilicus, is continuous, as it has been from the first, with the surface of the embryo. When completed it constitutes the internal membrane of the ovum; and from its inner surface there exudes a liquid (*liquor amnii*) which is essential to the safety and further development of the embryo—not by affording it nourishment, to any extent, but by the mechanical support and protection which it constantly maintains. The liquid consists of water, holding in solution a small quantity of albumen and salts. It is at first limpid, but towards the end of pregnancy it becomes of a higher specific gravity, and is often milky, or of a darker color, with numerous albuminous flakes. When the hue is greenish, or dark in shade, this is probably due to the escape of the contents of the bowel. The quantity of the liquid varies extremely, and that, too, without apparent cause; and while its actual quantity may be said to augment during the whole period of gestation, it is generally admitted that, relatively to the size of the fœtus, it increases during the first half of pregnancy, and diminishes from that time onwards. In addition to the protection of the fœtus from shock, which must manifestly be exercised to the greatest advantage during the early months, the liquor amnii gives room for the movements of the fœtus, which we cannot doubt to be essential to its proper development, and for changes in position or posture, in obedience to the laws of gravity. It protects also the umbilical cord from pressure, and, during labor, prevents the walls of the contracting uterus from pressing prematurely on the surface of the child, while it safely and expeditiously effects the mechanical dilatation of the os. Finally, omitting for the present the possibility of its being a source of nutriment, it is of great assistance to the accoucheur, preventing the firm contraction of the uterus upon the child, and so facilitating in many ways both manual and instrumental operations.

External to the amnion, the interval between it and the chorion is occupied by a liquid of greater consistency than that of the amnion. To this Velpeau gave the name of *vitriform body;* and imbedded, or rather floating in it, is found the remains of the umbilical vesicle. The long pedicle of the umbilical vesicle escapes from the cord, by an aperture in its sheath, and it is in this way that the vesicle ultimately comes to lie *between* the chorion and the amnion, as will be more clearly demonstrated in the illustrations which follow. The closure of the amnionic cavity, the formation of the allantois, and the connection thus ultimately established between the embryo and the exterior of the ovum, complete the essential parts of the ovum. The latter now consists—

a. Of the Embryo.

b. Of the Liquor Amnii, in which it is suspended.

c. Of the membrane of the Amnion, which is the internal membrane of the ovum, and which forms a sheath to the umbilical cord. The pedicle of the umbilical vesicle passes through an aperture in this sheath.

d. Of the Urachus or pedicle of the Allantois, and other parts which, together, form the Umbilical Cord.

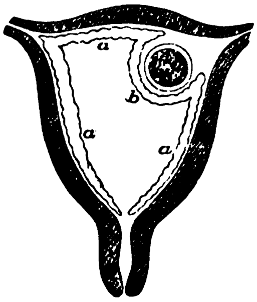
e. Of a space between the amnion and the chorion, containing the vitriform fluid and the Umbilical Vesicle.

f. Of the Chorion,—the external envelope of the ovum.

These parts, although their development is due, in some measure, to maternal influences and material, may be termed embryonic. Other structures are, however, being simultaneously developed, which may be regarded as in whole or in part maternal.

The outermost of the three coverings of the ovum, one which, according to every hypothesis hitherto advanced, must be looked upon as purely maternal in its origin, is the *decidua*. The theory originally propounded by Hunter, and adopted by the great bulk of physiologists down to the time of Coste, was simply this: That the congestion and excitement coincident with impregnation, caused, on the inner surface of the uterus, an exudation of a new formation of the nature of coagulable lymph, which closed the orifices of the Fallopian tubes, leaving only one opening, corresponding to the internal os. The ovum, on its arrival in the uterine cavity, was assumed to push this membrane before it, so that the decidua became naturally divided into two parts, that which adhered to the uterine surface (*decidua vera, a*), and that which invested the ovum (*decidua reflexa, b*). Subsequent observation having shown that a portion of membrane, identical in its structure with these, was found behind the ovum,—between it and the uterine wall,—this was regarded as a formation subsequent to the arrival of the ovum, and was named the *decidua serotina*. This ingenious theory owed its general acceptance to the fact, that it afforded a complete and rational explanation of what had frequently been observed in abortions—that the complete ovum was found to be inclosed in a pouch, which was shed from the uterus, and which thence derived its name. The theory universally adopted by modern physiologists is, however, quite different from this.

FIG. 58.

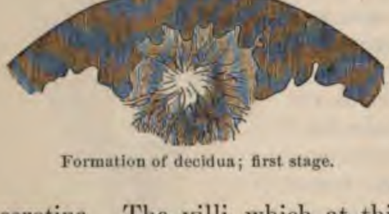


Diagram, showing Hunter's theory as to the formation of decidua.

We have already seen, in our notice of the mucous membrane of the uterus, as observed in women who have died during menstruation, that it is at these periods greatly hypertrophied and congested, and, in consequence, thrown into convolutions. (See Fig. 47.) Up to a certain point, the changes after impregnation are identical with those which accompany the menstrual molimen. According to Robin, the columnar and ciliated epithelium is partly exchanged, during the progress of pregnancy, for the tessellated variety, and partly desquamated. Sharpey and Weber found that the decidua vera was, allowing for the changes above mentioned, identical in structure with the mucous membrane of the uterus; and, especially, that the characteristic tubular glands were abundant, and much more distinct than in the unimpregnated condition. By others, the orifices of the Fallopian tubes were found to be free. As regards the decidua reflexa, greater difficulties had to be surmounted. If this portion of the membrane be examined at an advanced period of pregnancy, it is found to be thin and transparent, if indeed it can be separated from the decidua vera; and it then presents no trace whatever of the tubular glands. At an earlier period, the glands are found to be absent in the central or more prominent portion only, becoming more distinct, however, as we approach its point of contact with the decidua vera. In fact, we may assume with Coste, that the views of Bischoff are, on this subject, incorrect, and that, on its first formation, the decidua reflexa is identical in its structure with the decidua vera. All this points irresistibly to the conclusion that the decidua is nothing else than the uterine mucous membrane, altered to suit the requirements of the case.

The main difficulty which, on this view, will suggest itself to the student of physiology, is to account for the manner in which the ovum gets *behind* the mucous membrane. Here we must be content with theory; but it is a theory founded directly on the facts which modern physiology has revealed, and certainly preferable to that of Hunter, more especially as accounting for the existence of the decidua serotina. The ovum, on its arrival in the uterine cavity, is for a certain time free from all adhesion. Probably, it becomes arrested in one of the sulci between the convolutions into which the mucous membrane is thrown, and there it contracts adhesions, at the point where the placenta will presently be formed. On either side of it, there now rise projections of the mucous membrane (Fig. 59), as we have seen to occur in the formation of the amnion, and in that of the organs of special sense: the folds meet in the centre, and the involution is complete, *a* (Fig. 60) being the decidua reflexa, *b* the decidua vera, and *c* the decidua serotina. The villi, which at this time are abundantly developed on the surface of the ovum, are assumed by some to be received into the orifices of uterine glands, and, indeed, Sharpey actually found this to take place in the case of the bitch. The simple fact of extra-uterine pregnancy seems, however, sufficient to show that, although this may occur, it is by no means essential as a step in development. But, what-

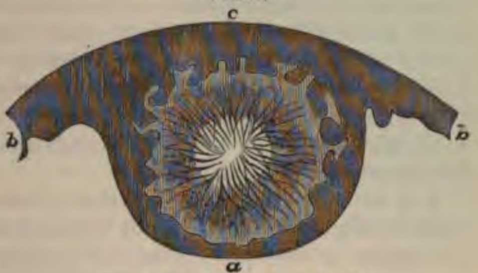
FIG. 59.



Formation of decidua; first stage.

ever view we may be inclined to take of this theory, the facts are these: If we open the uterus of a woman, about the fifth week of pregnancy, we find, almost certainly, a tumor in the neighborhood of the fundus, and projecting into the cavity of the uterus. The Fallopian tubes are open, and the membrane which covers the tumor is continuous, and identical in structure, with that which lines the uterine cavity, the glands being probably more distinct near its base. The tumor, on being incised, discloses a cavity containing an ovum. All this seems to indicate that the theory of Coste is, at least, more likely to be correct than any hitherto advanced.

FIG. 60.

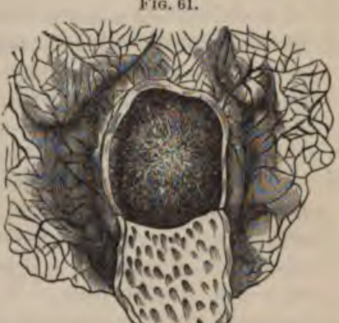


Formation of decidua completed.

If, in the course of such an examination as has just been indicated, the cavity be carefully opened, and a flap turned down, the ovum, quite uninjured, may then be observed, sometimes bathed in blood when bloodvessels have been injured. Its external surface will be seen, bristling with villi, and on the inner surface of the everted flap small depressions or lacunæ may be noticed, into which the villi dip, and by means of which, no doubt, material is obtained for the time from the circulation of the mother. If, again, we cautiously remove the ovum and wash out the cavity, we shall find that the lacunæ on the side of the decidua serotina are much deeper, and more numerous. This marks the place at which the placenta is about to form.

If we look again at Fig. 61, we may observe that in the most projecting part of the ovum, which is the centre of the everted flap, the membrane has become thin and exsanguine; and here, even at this early period, we would probably look in vain for the tubular glands. This is the commencement of another and an important change which goes on, *pari passu*, with the development of the placenta. Those villi of the chorion which pass towards the decidua serotina are more and more developed, and become imbedded in the latter, the two together forming the placenta, an organ to be immediately described. So soon as this new connection is thoroughly established, the villi over the remaining surface of the ovum commence to atrophy, and are ultimately absorbed, the external surface of the chorion being then perfectly smooth. With this, the decidua reflexa loses its vascularity, the vessels becoming obliterated from the centre of the projecting

FIG. 61.



Flap of decidua reflexa turned down, disclosing the ovum.

part towards the circumference. As development progresses, the ovum steadily increases in size, and the cavity which exists between the two layers of decidua becomes, in consequence of this, encroached upon, until, about the third month, the two come into contact, and the whole of the uterine cavity is then occupied by the fœtus and its membranes. It is impossible after this stage to distinguish or separate the decidua vera from the decidua reflexa, which has led Dr. A. Farre to think it probable that the decidua reflexa, after becoming extremely attenuated, ultimately disappears entirely.

Let us now turn again to the interior of the ovum, the essential parts of which were completed by the formation of the allantois. The elongation of the pedicle of the allantois, and the obliteration of its cavity, takes place with great rapidity, and, at the same time, the cord becomes greatly increased in length. From this period onwards the *umbilical cord* consists of the following parts: the amnionic sheath, which entirely surrounds it, save at one point, where a small slit gives egress to the pedicle of the shrunken umbilical vesicle; the two umbilical arteries and the umbilical vein, which form the greater portion of the bulk of the cord; that portion of the pedicle of the umbilical vesicle which extends from the umbilicus to the point of exit; and lastly, the remains of the pedicle of the allantois. By means of the villi of the chorion, acting, as Professor Owen has observed, like the spongioles of a plant, nutriment is extracted from the maternal soil in which it is imbedded, each vascular tuft being, as it were, an independent centre of respiration and nutrition. But, with the complete formation of the umbilical cord, these functions become localized in the human race, and there now begins to form, at the point, probably, where the allantois first touched the wall of the ovum, an important special organ of connection, the *placenta*, in which externally the umbilical cord terminates. The umbilical cord being composed of the elements above detailed, conducts the fœtal blood from the bifurcation of the abdominal aorta to the placenta by its two arteries, and brings back the same blood by means of its single vein, it having meanwhile undergone certain changes. The obliteration of the umbilical vesicle soon admits of the closure of the aperture alluded to, and thus simplifies the construction of the cord. This communication between child and placenta varies considerably in length. At first it is short, and is also thick in proportion to the size of the ventral aperture, but soon becomes considerably elongated. Even at the termination of pregnancy, however, great varieties are observed, it being in some instances no more than a few inches in length, and in others extending to five feet or even more. Its average length, at the full time, may be assumed to be somewhere about twenty inches. The vessels, which are devoid of valves, and which give off no branches in the cord, are disposed, in regard to each other, in a manner somewhat peculiar. Firmly bound together by a tenacious substance called the gelatin of Wharton, the quantity of which determines, in a great measure, the thickness of the cord, the vessels are invariably twisted like the handle of a basket. This does not take place in an irregular manner; on the contrary, the twist is, nine times out of ten, from right to left, and invariably the vein forms as it were a centre or axis, around which the arteries are arranged in an irregularly spiral form. This twisting, which has been observed as early as the second month, is supposed to depend partly upon the movements of the fœtus, and partly upon a more rapid growth of the arteries than of the other tissues of the cord. On an average, the cord is about the thickness of the little finger. Many anomalies have been observed in the formation of the cord. One artery, three arteries, and even three veins, have been met with without anything untoward having occurred, in any stage of the case, in the course of pregnancy.

When the cord is too long, knots have frequently been observed upon it. These are, doubtless, due to the movements of the fœtus, and are much more likely to occur if, along with great length of the cord, there is an excess of the liquor amnii. It is easy to understand how, under such circumstances, the fœtus might float through a large loop, and a knot be the immediate or ultimate result. It is conceivable that danger might arise from this, in the course of labor, should any mechanical complication tend to draw the knot tighter; but all experience seems to show that these knots are not to be looked upon as dangers, unless under such very exceptional circumstances.

The cord is of very considerable strength, as a general rule, as is shown in cases where—often in error—considerable force is brought to bear upon it, in attempts to remove the placenta when this organ is retained. At other times a very moderate tension will suffice to break it. It is firmly adherent, at its fœtal extremity, to the abdominal walls of the child, and, at the placenta, it is found to be intimately connected with the tissues of the chorion. Externally, its connection with the amnionic sheath is of a slighter character, and this is more particularly to be observed near the placenta, where the amnion often passes off from it near the point of its insertion, and thus forms a sort of infundibuliform investment, which has been noticed by many authors. Nerves and lymphatics have been described as appertaining to the umbilical cord, but these, if present, are so difficult to trace that their existence is very generally doubted.

The Placenta.—The ovum is, as we have seen, supplied with nutriment, in the first instance, directly from the contents of the umbilical vesicle through the channel of communication which exists between it and the intestinal canal; subsequently, in all probability, through the medium of the omphalo-mesenteric circulation; and, at a still later period, before the formation of the allantois, through the villi of the chorion by imbibition. When, through the agency of the allantois, the umbilical vessels have been projected to the walls of the ovum, a more direct means of communication is at once established. In the lowest mammalia, which are hence called "non-placental," no further change takes place in this respect—the whole periphery of the chorion exchanging elements with the maternal parts, as in the early human ovum—until the period of birth. In many of the higher mammalia, as in the Ruminants, certain portions of the surface of the ovum contract with the superimposed maternal parts more intimate adhesions, while other parts become comparatively deprived of their villi. An increase of tissue at these points gives rise to the formation of "cotyledons," which may be looked upon as so many miniature placentæ. In Man, however, and the higher orders, these are confluent, or rather are concentrated at one spot, and thus form the single connective organ which is known as the placenta.

The disappearance of the villi over the remaining portion of the surface of the chorion, concentrates within the new organ the functions of nutrition and respiration, which it has thenceforth to discharge. A study of its structure is of peculiar interest to the obstetrician, as any diseased or other condition which may influence the due performance of its functions must necessarily exercise an important influence on the healthy and normal development of the embryo. In many of those animals in whom a placenta exists, that portion which is derived from the ovum may be readily separated from the part which is of maternal origin; but, in the human placenta, no such separation is in any way possible, so intimately are the two elements incorporated together. We must, nevertheless, look upon the placenta as composed originally of two distinct parts or layers, which are accordingly named the *maternal* and *fœtal* portions of the placenta.

The maternal portion is developed out of that part of the uterine mucous membrane to which the ovum attached itself on its arrival in the uterus. In other words, it is the decidua serotina. No sooner has its formation commenced, than the bloodvessels in the corresponding region of the uterus become notably enlarged, the arteries retaining their characteristic spiral form, while the diameter of the venous trunks becomes so much increased, that they are now called sinuses. The vascularity of the decidua serotina thus becomes greatly augmented. On the other side, or fœtal portion, the chorion and its villi become enormously hypertrophied, and the umbilical vessels permeate its tissue throughout. It must not be supposed, however, that in the developed human placenta there is any line of demarcation between the two portions of the placenta, at which the vascular system proper to each is walled in; on the contrary, throughout the whole of its structure, the maternal and fœtal vessels are intimately commingled, and yet to their uttermost subdivisions essentially distinct. Numerous observations have proved this, but none more distinctly than the experiments of Bonami, to which we shall immediately refer. Before doing so, however, it is necessary to observe that, on separating a placenta from its uterine attachment by cautiously drawing the parts asunder, it becomes obvious that a special tissue intervenes. This has been described as separating into two thin gelatinous layers, consisting when *in situ* of interlacing lamellæ, adhering at certain points only of their surface, and thus forming cells which may be shown on gently drawing the parts asunder. This is the *inter-placental* or *inter-utero-placental* tissue.

Bonami demonstrated so far the structure of the placenta by colored injections as follows: He injected—

1st, *Red*, from the iliac and ovarian veins:

2d, *Blue*, from the uterine arteries:

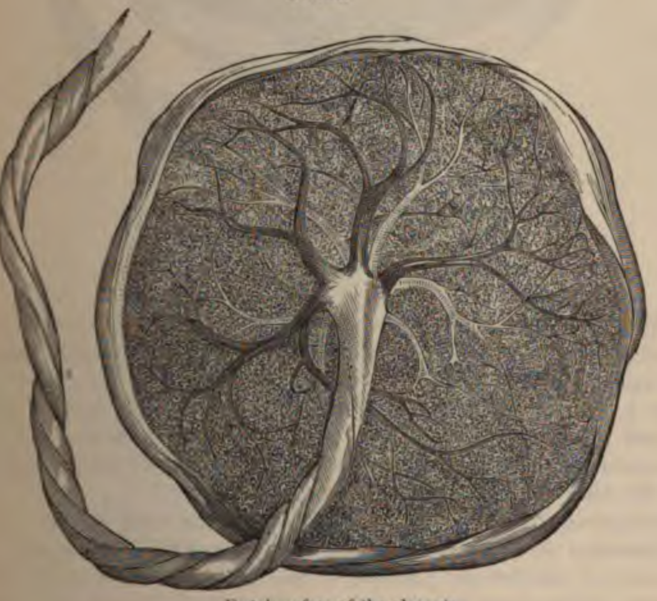
3d, *White*, from the umbilical vein:

4th, *Yellow*, from one umbilical artery, the other being tied to prevent the regurgitation from the anastomosis, which would otherwise have occurred.

Careful observation and dissection then disclosed the following facts: that numerous *red* vessels were visible through the amnion on the fœtal surface of the placenta; that *red* and *blue* vessels, the former straight and the latter spiral, were seen to pass in great numbers through the *utero-placental* tissue, and to penetrate the placenta; and, finally, that a *white* and *yellow* network was distinctly seen on the uterine surface of the placenta. As no escape of the injected fluids had taken place into the intermediate tissues, the facts speak for themselves.

Before proceeding to consider the more minute structure of the placenta, some general description of the physical characters of the mature organ may here be given. On its removal from the body, it is found to be a soft spongy mass, about twenty ounces in weight, and seven and a half inches in its greatest width. These are, of course, average dimensions, as it varies greatly in size; and, on the same principle, it is described as being three-fourths of an inch thick in the centre, and one-eighth to one-fourth of an inch at the margin. It is usually somewhat oval in form, and the umbilical cord is inserted in the centre of its fœtal surface. It may be situated at any portion of the uterine surface, even over the os, but its usual site is the neighborhood of the fundus. It presents for observation an internal or fœtal, and an external or uterine surface.

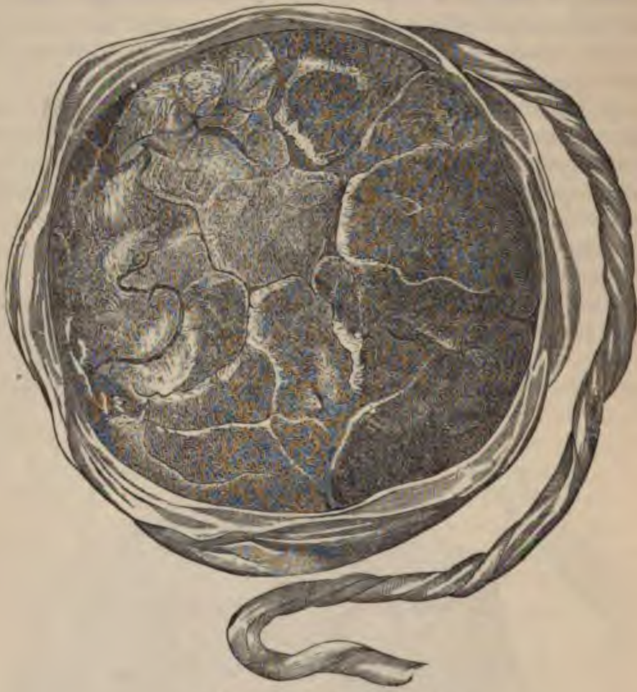
Fig. 62.



Fœtal surface of the placenta.

The internal surface (Fig. 62) is smooth, and is covered by the amnion, through which the vessels are distinctly seen to divide and subdivide before plunging into the tissue beneath. The external or uterine surface (Fig. 63) is very different from the former. It is slightly rough on the surface, giving a peculiar granular impression to the finger, very familiar to every obstetrician. It is, moreover, divided into irregular lobes, which may be easily torn or separated from each other. Indeed, examined from this side, the substance of the placenta may be said to be brittle. On this surface may be seen the gaping orifices of ruptured maternal vessels. The margin is continuous throughout with the membranes; the fœtal portion with the chorion, and the maternal with the decidua.

FIG. 63.



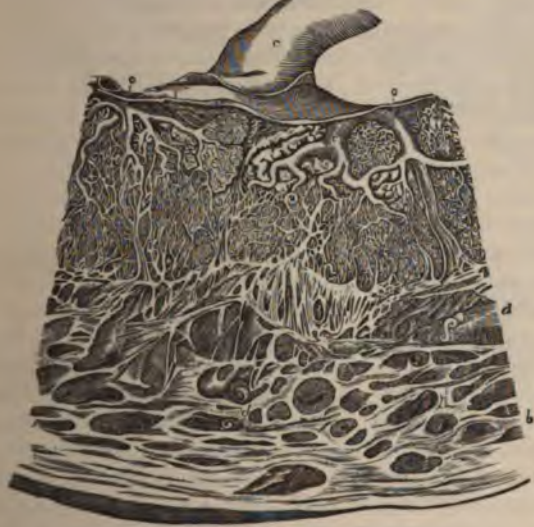
Maternal surface of the placenta.

Peculiarities in the structure of the placenta, and in the manner of its connection with the umbilical cord, are not very uncommon. What is known as battledore placenta is one of the most common of these, the cord being then attached, not to the centre, but to the margin of the placenta, giving it something of the form from which it has derived its name. In other cases, although much more rarely, small lobes or cotyledons are found detached from the general mass, as in a case figured by Dubois; while in twin cases certain modifications are observed which are essential to the dual development, but which will fall more naturally to be considered under the section relating to plural pregnancy.

The structure of the placenta being thus complicated, it is not to be wondered at, that great difficulties have been encountered in determining what is the nature of the communication which then takes place between the fœtal and maternal circulating systems. An opinion long obtained that there was a direct commingling of the two currents, and that blood passed from the uterine arteries directly to the fœtus, and, after there yielding a portion of its vital constituents, returned again by the uterine veins. The earliest attempts at injection, being no doubt unskilfully executed, seem to have encouraged this belief. Modern physiologists have long since dispelled this illusion, and the experiments of Bonami above cited demonstrate, along with others, that there is a maternal and a fœtal circulation, each being distinct from the other as regards continuity of current down to its uttermost conduits. The vessels of the two systems are, however, in intimate contact throughout, as is made obvious at once by anatomical demonstration, and by a knowledge of the physiological necessities of the case. What, then, is the nature of the contact which permits of an interchange of material between the two?

In attempting to answer this question, and to describe the minute structure of the placenta, it must be admitted that there are still many points in regard to which differences of opinion exist, and some difficulties which have yet to be explained. To enter upon a full consideration of these would ill accord with the expressed object of this

Fig. 64.

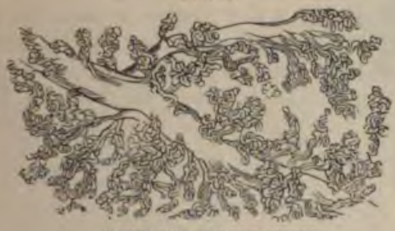


Section of the placenta.

work, but the general views of the case, as adopted by the best authorities, may here be briefly epitomized. The vessels which are seen to pass through the utero-placental tissue are, with an important exception to be noticed afterwards, of two kinds, arteries and veins. The former, the "curling arteries" of the uterus as they are generally called, are of moderate size; they do not anastomose much, nor are their ramifications very numerous, and they retain, within the placenta, in a certain degree their spiral disposition. The veins are somewhat larger, straight in their direction, and with numerous anastomoses. Some have supposed that the connection between these veins and arteries was of the nature of a simple capillary circulation, but the researches of Reid, Weber, and Goodsir, have shown that their connection is of a special character, and offers the strongest possible contrast to a capillary system. According to them, the blood is conducted by the curling arteries into large irregular cells, or *sinuses*, the walls of which are thin, and composed of the lining membrane of the maternal vascular system only. These sinuses communicate freely with each other, and from them the blood is returned to the uterus through the veins which are seen to pass through the utero-placental tissue. In fact, a considerable portion of the bulk of the placenta, when the organ is replete with blood, is said to be composed of a great venous cavity, which dips so deeply into the chorion as to attain its fœtal surface, but which is more distinctly seen in the tissue of the decidua. A large coronary vein has been described by Jacquemier and Meckel, as existing near the margin of the placenta. It is, they say, rarely complete, but presents in its course frequent interruptions, where the continuity is maintained by subdivision and anastomosis; but as their observations on the subject have not been confirmed by recent research, we may assume that the existence of such an arrangement is doubtful, certainly not constant. It is proper to add that the presence of a great venous cavity within the placenta has quite recently been seriously called in question.

On the fœtal side, the vessels, on reaching the placenta, divide at once into large branches which are distinctly seen through the amnion. If this membrane be detached, which may easily be effected, as shown in the upper part of Fig. 62, both arteries and veins are observed to divide on the surface of the chorion. They then subdivide again and again, always dichotomously, and plunge into the thickness of the lobes. Here the arteries communicate freely with each other, so that if we inject one umbilical artery, the injection will return by the other. If, however, we tie the other, a successful injection will return into the umbilical vein, while the color of the injection will be observed on the uterine surface of the placenta. If we trace the arteries to their ultimate ramifications, we find that they are divided into innumerable tufts, fringes, or *villi*, which form in fact the bulk of the fœtal placenta. Each tuft is occupied by one or more capillary loops, and the current after passing through these loops, returns by the affluent canals, forming by their union the umbilical vein. The vessels of this capillary system differ from other capillaries in their greater size, their calibre being such as to admit of several blood-corpuscles passing abreast of each other. Throughout the whole placenta the villi are found to project in the form of fringes into the placental sinuses, or in other words, into the large venous cavity which is formed in the placenta by the union of these sinuses. Each fringe is thus bathed in maternal blood, and the fœtal blood passing through each loop parts with its carbonic acid and receives oxygen in exchange, precisely as occurs in the branchiæ of aquatic animals. And, further, as was first shown by Reid, a certain number of the fœtal villi pass *through* the placenta, and dip directly into the larger sinuses of the uterus itself.

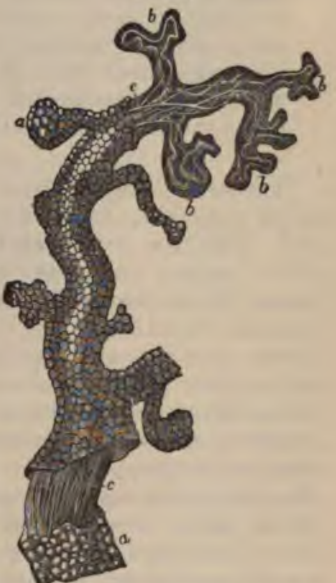
FIG. 65.



Fœtal villi of the placenta.

Reid believed further, and his view is very generally accepted, that each tuft, in projecting into the placental cavity, pushed before it the lining membrane of this cavity, so that each fœtal villus had a special maternal investment. It is to be observed, however, that among English physiologists, Dr. A. Farre combats this view, and that both Coste and Robin are opposed to it. They believe that the walls of the uterine vessels are eroded and perforated by the villi, so that the walls of the latter are in direct contact with the blood of the mother. It will be observed, however, that either view of the case is sufficient to confirm the view first enunciated by the Hunters, that there is no commingling of the two systems. The accompanying illustrations refer to the arrangement and structure of the fœtal villi. In Fig. 66, the cellular covering which covers the villus is shown, except at its distal portion, where it has been removed to show the looped vessels.

FIG. 66.



Ultimate fœtal villus, highly magnified.

It must be remembered that the oxygenation of the fœtal blood is not the only function of the placenta; but that through this channel also, material is supplied for the building up of the fœtal tissues, and effete matter is removed. The observations of Goodsir on this point, which are of the greatest possible interest, are corroborative of the views of Reid. These will be noticed when we come to speak of the nutrition of the fœtus.

The formation of the placenta commences in the latter part of the second month, and within a few weeks it acquires its essential characteristics. Small bloodvessels, for the special nourishment of the organ, pass from the uterus, but neither nerves nor lymphatics have been traced.

CHAPTER VII.

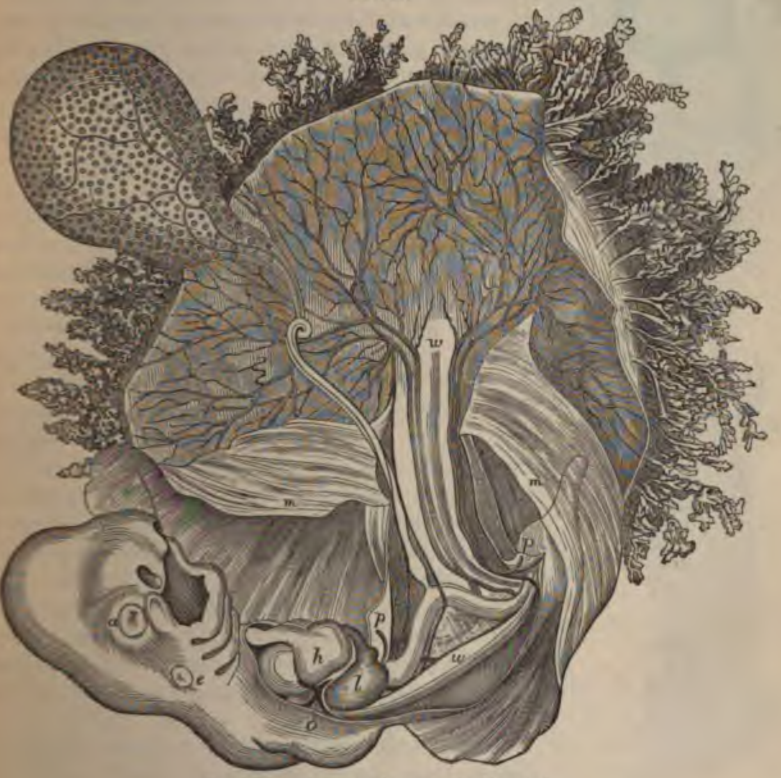
DEVELOPMENT OF THE EMBRYO AND FŒTUS.

DEMONSTRATION OF EMBRYONIC STRUCTURES—CHARACTERISTICS AND DEVELOPMENT OF THE FŒTUS AT THE TERMINATION OF EACH MONTH OF PREGNANCY, FROM THE THIRD ONWARDS—DIMENSIONS OF MATURE CHILDREN—OF THE POSITION AND ATTITUDE OF THE CHILD IN THE WOMB—CAUSES OF CRANIAL PRESENTATION: THEORIES OF "PHYSICAL GRAVITATION," "VOLITION," AND "REFLEX ACTION"—THE FŒTAL CRANIUM: SUTURES: FONTANELLES: DIAMETERS—DEFINITION OF THE TERM "VERTEX"—FUNCTIONS OF THE FŒTUS: CIRCULATION: RESPIRATION: NUTRITION: SECRETION.

THE term Fœtus is, according to usage, not applicable to the product of conception, until the termination of the third month of gestation. Till then it is termed the embryo. A study of the formation of the various embryonic structures is a subject which, in so far as human development is concerned, is beset with many difficulties. Viewed, however, in the light which comparative physiology has thrown upon it, our knowledge of the various organs of which the individual is composed, and of their growth from primal elements, may be considered as tolerably complete. The opportunities which arise of examining the bodies of women who die in the earliest stages of pregnancy are so few, that a very peculiar interest attaches to the few reliable descriptions and representations which have hitherto been made. Among these, none perhaps have received more unqualified commendation than the well-known drawings of Coste, from which the representations which follow have chiefly been taken. To attempt a demonstration, or even a narrative of the development of individual organs, is only suitable to a systematic treatise on Embryology. A very superficial description will serve our purpose here, and may suffice to show, more clearly than is possible by any means other than actual dissections, the relations which the various parts of the ovum bear to each other, and to the maternal structures with which they are in contact.

The accompanying representation of the product of an abortion about the twenty-fifth to the twenty-eighth day, shows the embryo and its membranes partly dissected, and magnified about seven times and a half. The Chorion, which has been opened in its whole extent, is recognized by its villi externally, and the numerous bloodvessels on its internal surface. Above, and to the left, is seen the umbilical vesicle, with the branches of the omphalo-mesenteric vessels coursing upon it. It lies, as has already been shown, between the chorion and the amnion, and its long narrow pedicle bearing the vessels is seen to pass through the amnion into the umbilical cord, and, finally, to terminate at the summit of the single curve which marks the commencement of the intestinal convolutions. The right omphalo-mesenteric artery is close below the intestinal canal, and included in the rudimentary mesentery. The left omphalo-mesenteric vein (*v*), is passing towards where the stomach is beginning to develop, to discharge itself into the common trunk of the umbilical veins. This is the commencing vena portæ. The amnion (*m m*) has been freely opened to allow the embryo to escape, the caudal extremity being still within its cavity. The manner in which it is reflected to form the sheath of the umbilical cord is very

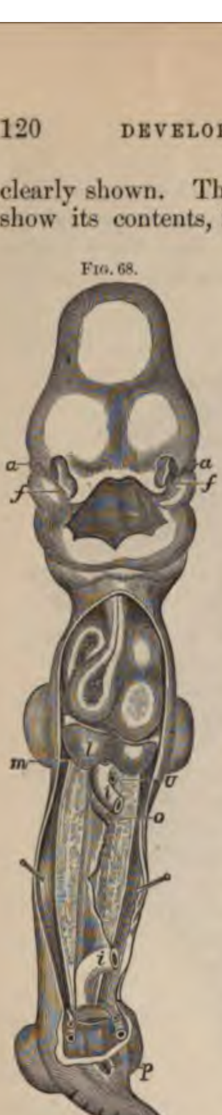
FIG. 67.



Ovum opened, and embryo partly dissected.

clearly shown. The umbilical cord is opened in its whole extent to show its contents, including the canal of the urachus (pedicle of the allantois), which extends from the caudal extremity of the alimentary canal, closely accompanied by the umbilical vessels, and terminates at *w* in a cul-de-sac. On either side are the umbilical arteries and veins, the arteries springing from the lower part of the aorta, and the veins passing upwards, to unite before entering the liver and mix their contents with the general circulation, at the point of confluence (*o*), beneath the heart. The vein of the left side, which may be observed passing through the centre of the mesentery, is the permanent one, and is already much larger than its fellow of the right side, which has been cut across at *p p*. The heart (*h*), with its four cavities and the aortic bulb, is separated from the liver by an imperfect diaphragm. The Wolffian body of the right side (*w*), is shown passing from the heart to the inferior extremity of the intestine. Along its outer margin runs its excretory duct, which opens, along with its fellow of the other side, into the cloaca behind the rectum. The greater relative size of the cephalic extremity of the embryo is a striking peculiarity which at once attracts attention. The rudimentary eye (*a*) is remarkable, chiefly in respect of its lateral position. In front of it is the right nasal fossa, and below it, at *e*, is the earliest trace of the internal ear. The large bucco-nasal cavity, with the three branchial arches beneath it, also attract special notice.

FIG. 68.



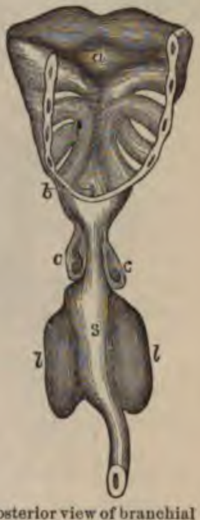
The same embryo, further dissected.

Fig. 68 shows the same embryo magnified eleven times, carefully dissected, and seen from before. A portion of the intestinal convolution and of the mesentery has been removed, along with the anterior thoracic and abdominal walls, and the umbilical cord, so as to bring into view the most of the Wolffian bodies on each side, and the heart.

This representation shows more clearly the lateral position of the eyes (*a*), and the distance between the nasal fossæ (*f*), which are seen to communicate with the buccal cavity by a simple furrow. Between *a* and *f* are the rudiments of the superior maxillary bones. There is complete absence of all trace of palate. The position of the auricles, ventricles, and aorta, and the relation which these parts bear to each other at this age, are also more obvious from this point of view. Hidden to some extent by the heart, and separated from it by an incomplete diaphragm, is the liver (*l*), which is of equal size on the right and left side, and presents a fissure on its lower surface: it covers and conceals the stomach. The vessel which is seen in section within this fissure (*m*), is the common trunk of the umbilical veins. To the left, within the curve of the intestine (*i*), is the left omphalo-mesenteric vein (*v*), the one which, being permanent, ultimately becomes the vena portæ. Below the alimentary canal, and within the mesentery, is the right omphalo-mesenteric artery (*o*).

Extending downwards from the lower surface of the liver to the caudal extremity of the embryo, are seen on either side the Wolffian bodies, with their excretory ducts close to their external borders. The white band running along their inner margin is the rudiment of the internal generative organs. Between these parts is the divided mesentery, connected inferiorly with the alimentary canal (*i*). Immediately below this, the transverse slit shows a section of the cavity of the urachus, while the vessels which along with it form the umbilical cord are seen to surround it, the veins being below the arteries. It will be observed that one vein is already smaller than the other, and would ultimately have become obliterated. The buds or rudiments of the superior and inferior extremities are quite distinct; *p* is the common orifice of the genito-urinary system.

FIG. 69.

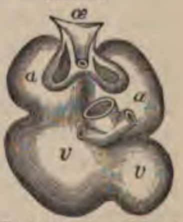


Posterior view of branchial apparatus, &c.

Fig. 69 shows the branchial apparatus, rudimentary lungs, stomach, and liver, from behind. Above, is the inferior maxilla, the two lateral halves of which have already united in the middle line. Between this and the superior branchial arch is the rudiment of the tongue. From above downwards are the first, second, and third branchial arches, separated from each other by slits or apertures (*branchiæ*). Into the pharyngeal cavity which is thus exposed, the branchial apertures, the œsophagus, and the glottis open. The origin of the glottis is an oval eminence with a slit, which is indicated at *b*: *c c* are the rudimentary lungs pressed against the œsophagus, the *right* being lower than the *left*: (*s*) the stomach, at this period vertical in direction, and forming with the œsophagus and alimentary canal, a nearly straight tube: (*l*) the liver, formed on either side of two nearly equal lobes, with a large furrow between them to accommodate the stomach.

In Fig. 70 the heart is seen from behind. The lungs have been preserved in order to show the relation, in size and position, which they bear to the heart. (*a a*) Auricles, the right being evidently more developed than the left. (*v v*) Ventricles, the left larger than the right.

FIG. 70.



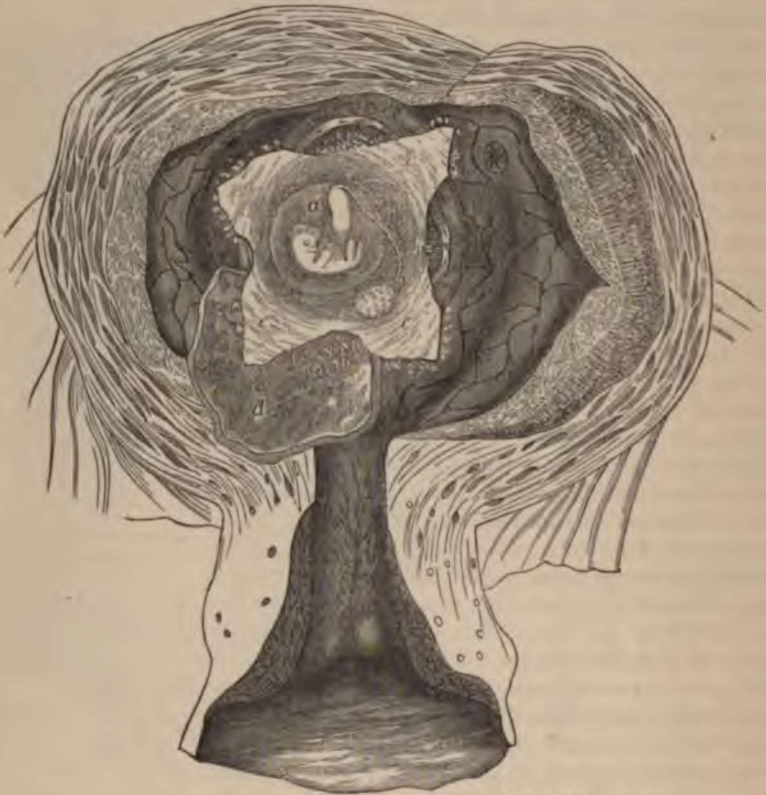
Posterior view of fœtal heart.

The large vessel in the centre is the trunk common to the omphalo-mesenteric, umbilical, and azygos veins. That to the right in the figure is common to the superior azygos vein (superior cava of the adult), and the inferior of the right side; the smaller trunk to the left is common to the azygos, superior and inferior, of the left side.

(*œ*) Section of œsophagus.

The woman from whom the drawing (Fig. 71) was taken was, as may be inferred from the structure of the os and cervix, pluriparous. She committed suicide about the fortieth day of pregnancy, and her body was subsequently examined at the Morgue in Paris. The anterior wall of the uterus has been divided vertically in its whole length, and the uterus thus laid open. "The cavity of the uterus," says Coste, "was partly occupied by a sort of soft fluctuating tumor, caused by the presence of the ovum at this point. This tumor had externally all the appearance and the organization of the mucous membrane which lined the uterus in the rest of its extent, and was situated on its posterior surface in the space between the two Fallopian tubes. The tumor produced here by the presence of the ovum did not yet occupy the whole cavity of the uterus. About the lower third of the cavity was free, so that the cavity of the uterus might be reached from the cavity of the cervix without encountering any resistance. The internal

FIG. 71.



Dissection of an ovum *in situ*, at about the fortieth day.

orifices of the Fallopian tubes were, as well as that of the cervix, perfectly permeable, which was proved in the clearest manner by the observation of the orifice of the left tube, through which the ovum had passed on its way to the uterus." In order to demonstrate the structure and relation of the parts, a circular incision was first made through the decidua reflexa, and the flap thus formed was turned down towards the internal os. On its inner or everted surface (*d*), the lacunæ are seen, which have already been described as existing at this period of pregnancy for the reception of the villi of the chorion. The ovum itself was then opened by a crucial incision, and the flaps of the chorion (*c c*) turned aside, so as to show the amnion (*a*). Through the walls of the latter membrane, the embryo is seen floating freely in the liquor amnii. The short and thick umbilical cord is observed passing from its ventral surface to that part of the surface of the chorion where the placenta would afterwards have been found. The situation of the umbilical vesicle in the cavity between the chorion and the amnion (a point which the student has occasionally some difficulty in understanding) is here very satisfactorily shown, and also the long pedicle which penetrates the umbilical cord, and through which communication with the intestinal cavity of the embryo is still for a time kept up. The amnion is not yet of sufficient size to fill the cavity of the chorion, which still contains the vitriform substance (*magma réticulé* of Velpeau). This substance gradually disappears as the ovum increases in size, becomes compressed, and ultimately is reduced to a layer of extreme thinness when the amnion and chorion come into contact, when all trace of the umbilical vesicle disappears.

After the development of the placenta is completed, and the villi of the free surface of the chorion have been absorbed (as some suppose, by a process of fatty degeneration), not only does the cavity between the chorion and the amnion disappear, but that which exists between the decidua vera and the decidua reflexa is also gradually encroached upon by the growth of the embryo. When these membranes finally adhere, that cavity, too, is obliterated; and now, for the first time, the product of conception may be said to occupy the whole cavity of the uterus. These changes are completed in the course of the third month.

At this period, the fœtus measures in length from five to six inches, and weighs about four ounces; and the development of its limbs and other parts has advanced to such an extent, that the external parts may be said to be completely formed. The head, although still, relatively, of great size, is so in a much less degree than at an earlier period. The various cavities are completely closed. The formation of the palate, and the completion of the superior maxillary bones, has divided the bucco-nasal cavity. The branchial arches have disappeared as early as the fifth week, with the exception of one fissure, which has developed into the external ear. The umbilical cord is already longer than the embryo, has assumed its characteristic spiral form, and is attached considerably below the middle point of the vertical measurement of the child. Previous to this, a loop of intestine occupied a portion of the cord, but this is now included, by contraction of the umbilicus, within the abdominal cavity. When that condition is permanent, umbilical hernia is the result. The globe of the eye is seen through the eyelids, and the pupillary membrane may be seen filling up the aperture of the iris. The nails have commenced to form, but are very thin, and almost membranous. The sexes are distinct.

At the end of the fourth month[1] the length of the fœtus will be found to have increased to from 6½ to 7½ inches, and its weight to nearly 9 ounces on an average. On examining the head, the fontanelles are found to be of great size, and the sutures apart. Hair makes its appearance on the scalp, in the form of a slight down, which may also be noticed, in a still more delicate form, on the general surface. Fat begins to be deposited in the subcutaneous tissue. The muscular movements are brisk, although they may not yet have been recognized by the mother; and in abortions which take place at this epoch, the movements are not only vigorous at the moment of birth, but may continue for several hours afterwards.

With the completion of the fifth month, the length of the body will usually be found to have increased to from 8 to 10 inches, and its weight to from 10 to 12 ounces, or even more.

At six months, it is from 11 to 12½ inches, and weighs something more than a pound avoirdupois. The growth of the hair has considerably advanced, and, in addition to that on the scalp, the eyebrows and eyelashes are also beginning to form. On the surface of the body, the cutaneous structure now becomes more distinct, and the cutis vera and epidermis may usually, on careful dissection, be separated. The invariable wrinkling of the surface is the result of the minute quantity of subcutaneous cellular tissue which is developed up to this time, in proportion to the other structures. In the male, the scrotum is very small and empty. The nails are already solid.

In the course of the seventh month the fœtus becomes from 12½ to 14 inches in length. The bulk becomes, from this period, steadily increased, by the deposition of subcutaneous cellular tissue, and the development of various organs; but as the extent of this varies very greatly in different cases, it is difficult to say what should be stated as the average weight of this period. The bones of the cranium—in which the process of ossification has already considerably advanced—become more prominent, and the intervals between them less. It is usually said, that about this time the pupillary membrane disappears; but this is a question in regard to which very considerable discrepancy of opinion has arisen. Velpeau denied the existence of the membrane in the human species at any period, but the opinion usually entertained in regard to this point, is that which we have mentioned,—that it exists during pregnancy, up to the termination of the seventh month, and then disappears. More modern observations have, however, shown that it is incorrect to suppose that this membrane is lost at the time mentioned, but that it loses its vascularity in a great measure, and is so transparent that great difficulty is experienced in its demonstration. "In every instance," says Mr. Jacob,[1] "where I have made the examination, I have found the *membrana pupillaris* existing, in a greater or less degree of perfection, in the new-born infant,—frequently perfect, without the smallest breach, sometimes presenting ragged apertures in several places, and, in other instances, nothing existing but a remnant hanging across the pupil like a cobweb. I have even succeeded in injecting a single vessel in the *membrana pupillaris* of the ninth month." The eyelids now commence to open, and the testicles to descend in the scrotum.

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[1] The expression, "at the ——— month," is very loosely employed by many writers. When weeks are not mentioned, it is used in this work as meaning the completion of the ——— calendar month of the pregnancy.

By the end of the eighth month, the increase in the bulk of the child and its general plumpness become very obvious, and this is shown still more clearly by taking its weight and measurement as before, when it will be found that whereas the longitudinal measurement has not increased beyond 17 inches, and is probably less, its weight will have reached 4 to 5½ pounds. The skin is now red in color, is no longer wrinkled, and is covered with down. Upon its surface is observed, in greater or less quantity, little masses of curdy or sebaceous matter—a substance which is not of new formation, although it has become much more abundant. It may be noticed as early as the fifth month. The scrotum now contains one testicle, usually that of the left side.

On the birth of the child at the termination of pregnancy, it will be found to measure from 19 to 24 inches, and to weigh about 100 to 120 ounces (say, on an average, about 7½ pounds avoirdupois). The umbilicus was at one time believed to mark, at the full term, the middle point of the body, but the careful observations of Moreau and Ollivier d'Angers show that this is not the case, but that the middle point is generally about three-fourths of an inch above the umbilicus. With the complete development of the child, there is, of course, increased thickness of the nails, and a considerable addition to the adipose tissue, which sometimes, indeed, is so considerable in quantity, as to raise the weight of the infant considerably above what has been set down as the average, and that without any corresponding increase in its length.

Many fables have been narrated as to children which have been born weighing 20 to 30 pounds, and being 3½ to 4 feet long. Twelve pounds is looked upon as a very great and unusual weight for a child at birth, but there are in this country few practitioners of experience who have not seen one or more such cases. In 4000 cases in the Maternité, Madame Lachapelle only found one child which weighed 13½ pounds. Dr. Rigby says that Sir Richard Croft delivered a living child 15 pounds in weight. Mr. Owens delivered a woman of a stillborn child[2] which weighed 17 pounds 12 ounces. Another case of a stillborn child which was said to weigh 19½ pounds is given by Cazeaux, but the weight was not taken by himself, and he seems to admit a doubt of it. Putting aside increased dimensions from disease, the above may be received as the extremes of authentic cases. It must be remembered, however, on the other hand, that many children, even at the full term, weigh much less than the average; but it is a recognized fact that, if the child be mature, it rarely survives if it weighs less than 5 pounds at birth, although its chance is considerably greater if a child of that weight be born prematurely. Female children weigh and measure less than males, and on this point it is said by Burns that 12 males are as heavy as 13 females. An interesting observation has been made by Dr. Guy, that "the mean weight of the bodies of still-born children exceeds the weight of such as have lived one day, by from about $\frac{1}{6}$ to somewhat less than $\frac{1}{3}$." In the last months, the size of the placenta becomes greatly reduced in proportion to the development of the child; thus, at the sixth month, it is nearly half the weight of the child, while at the full term it is but a sixth or a seventh.

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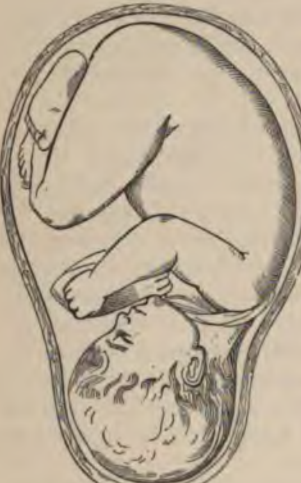
[1] Cyclopædia of Anatomy and Physiology. Art. "Eye."

[2] Lancet, 1835.

Position and Attitude of the Child in the Womb.—The shape of the womb being during the whole course of pregnancy more or less oval, the fœtus is found to assume from the earliest period a corresponding position and posture. In the early months of pregnancy, while the embryo still floats freely in the liquor amnii, and the envelopes of the ovum have not as yet come into contact with the uterine walls, the coincidence of the embryonic with the uterine ovoid is not an essential condition; but even thus early the ovoid form is being assumed, as is shown by the bending forwards, which approximates the cephalic to the caudal extremity. In this attitude, the development of the trunk and extremities proceeds, and, even at a period when there is still room for the fœtus to stretch itself, and extend its limbs, we find it constantly with back and neck bent, and limbs drawn up and flexed. This attitude of the fœtus becomes more marked as pregnancy advances; and ultimately at the full term, it is very constantly to be observed, as is shown in the accompanying diagram, with the vertebral column bent forwards, the chin inclined upon the sternum, the thighs strongly bent upwards on the belly, the knees bent, and the dorsum of the foot inclined towards the shin-bone. The arms, more or less apart, are bent at the elbows, and the forearms are crossed or folded on the breast. In such a position the child best adapts itself to the shape of the cavity in which it is inclosed, and which it pretty nearly fills.

FIG. 72.



Attitude of the fœtus in utero.

In no fewer than 96 per cent. of the cases of children born at the full term, the head of the child is turned—as in the figure—downwards towards the cervix of the uterus. The investigation of the causes which give rise to this law in gestation has long attracted the attention of obstetric writers. But, much as has been written on the subject, and ingenious as are many of the theories which have been advanced, it must be confessed that the problem has not yet been clearly solved. Few have prominently noticed the fact above mentioned, that the ovoid form of the fœtus is assumed while it is yet the embryo, and before it has been subjected to any influence arising from contact with the uterine walls. Manifestly, however, there is a cause—subsidiary it may be—which acts thus early on the embryo, to insure its safety at a later stage. But the point which, to the exclusion of others, has attracted, in this matter, the greatest amount of attention, is the *position* of the child, and the causes which lead to the inferior position of the head in such an enormous preponderance of cases.

The earlier theories which were propounded are more curious than instructive. It was very commonly assumed by the older writers that, in the early months, the head was normally uppermost, and that the sickness of early pregnancy was caused by an irritation produced by the hair on the scalp. It was further believed that about the seventh month the position became inverted, and that now, for the first time, the head was normally beneath.

Of all the theories which have been advanced to account for the presentation of the head, none attracted so much attention, or gained so much credence, as that which led to the opinion that it was due simply to physical gravitation. The fœtus, it was said, being suspended, by its centre, in the liquor amnii, by means of the umbilical cord, its heavier or cephalic extremity must, of necessity, gravitate downwards; and this view was strengthened by the fact, that the point of suspension was not the centre, but actually nearer the caudal extremity. It was obvious to those who refused to accept of this theory, that however it might be held as applicable to the first weeks of pregnancy, such a mechanism could have no share in producing or maintaining the position, after the cord had attained a length equal to the diameter of the ovum; and, further, if the theory were correct, that gravitation would be more likely to induce cephalic presentation in the early weeks of labor than at any other time. Every one knows, they argued, that, on the contrary, it is not at the beginning, but at the end of pregnancy, that this is most constantly observed, and, therefore, the idea in question is wrong. Dubois, who took a prominent position in opposing the gravitation theory, further disproved it by some interesting experiments, which he made by plunging fœtuses in water, and suspending them by the umbilical cord, when he found that it was not the head, but the scapula, or back, which hung downwards, and first touched the bottom. And to these arguments it might be added, that the placenta is not always attached to the fundus—which situation could alone admit of such gravitation; and again, that in the lower animals, the theory of gravitation would place the head at the fundus, whereas, here also, we find the head turned to the os. In women, moreover, who maintain the horizontal position during the whole course of pregnancy, the cranial position is as constant as in other cases.

An ingenious plea in favor of gravitation, as a cause of the ordinary position, has more recently been advanced by Dr. Matthews Duncan, who energetically controverts the opinions of Dubois, Simpson, and

Scanzoni, and who insists, with much propriety, that, in deciding this point, we should always remember that, while the mother is in the erect posture, or when she is lying on her back, the uterus is far from vertical; that, on the contrary, it is only when the trunk is inclined to the horizon, at an angle of 30°, that the uterus can be said to be vertical; and that the mature fœtus is only horizontal when the woman lies upon her side. Dr. Duncan's arguments are of too controversial a character to be usefully epitomized; but they must be referred to with the respect which they merit, and which they will always command.

The name of Dubois is, in this particular matter, associated with a theory, the evidence in favor of which is, we must admit, singularly inconclusive. M. Dubois supposed that, in obedience to some instinctive impulse, or act of volition, certain movements were, towards the end of pregnancy, executed by the fœtus, with the object of bringing the head into the lower segment of the uterus. This renowned obstetrician derives his chief argument from the harmony which he believed to exist between the object which nature had in view, and the means which she adopts, with a view to secure it. It is more than likely that Dr. Tyler Smith is correct when he surmises that, "had he (Dubois) written after the reception of Dr. Marshall Hall's great discovery of the spinal or physical movements, as distinct from the cerebral or psychical motor actions of the animal economy, he would probably have referred the motor powers of the fœtus to reflex action, instead of to instinct or volition."

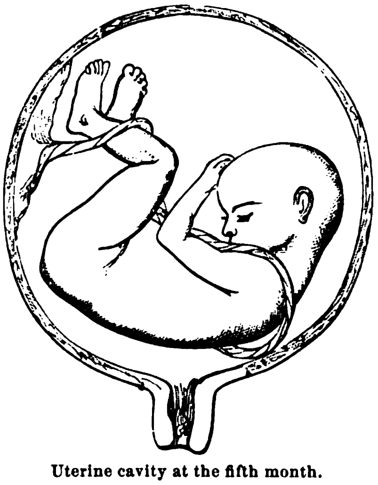
The late Sir James Y. Simpson, in a series of admirable papers on this subject, has attempted to prove that the position of the fœtus is due, in the first instance, to a succession of reflex or "adaptive" movements, and that, when it has once assumed the usual position, it is maintained in it, when displacement is threatened, by a repetition of similar reflex acts, which rarely fail to insure its reposition. It is in this way, and on this principle, that violent fœtal movements succeed such changes in the maternal position, as may lead to the displacement of the fœtus; and he adds, further, that in cases of long cord, and in those in which the quantity of liquor amnii is much above the average, such movements on the part of the fœtus are more frequent, and are of greater violence than usual. These last statements are certainly open to doubt. Cazeaux attaches great weight to the form of the uterus, as *mechanically* inducing the position of the fœtus in the last months of pregnancy, the broader or breech end of the fœtal ovoid being necessarily turned towards the fundus, and the smaller, or cephalic end consequently directed to the os. Some consider the child as composed of two ovals, one formed by the head, and the other by the trunk and limbs, and that corresponding to these, the outline of the uterus is observed to consist of a portion of two ovals, as may be seen by looking again at Fig. 72.

It must be remembered, however, with reference to these various theories, that it is only of cases at the full term that the head presents in 96 per cent.; and, with regard to most of the observations which have been made, that they have reference mainly to cases occurring at this period. It is universally admitted, that the earlier the period of the pregnancy, the less constant is the position of the child. The following table, founded upon the observations collected by Professor Dubois, at the Maternity Hospital of Paris, has been constructed by Simpson, and is, as he says, sufficient to prove "that the position of the fœtus, with the head lowest, and over the os uteri, does not begin to be assumed till about the end of the sixth month, and that it is taken up with increasing frequency and certainty from that period onwards, to the full term of pregnancy." It must be noticed, however, with reference to this table, that, whereas the returns for the first, second, and fourth lines, have reference to children born during the specified period, whether alive or dead, the figures in the third line, of children born during the eighth and ninth month, refer only to children born dead.

Period of Pregnancy.	Total Cases.	Presentations of			Percentage of Head Presentations.
		Shoulder.	Breech.	Head.	
Before end of sixth month, . . .	121	5	52	65	52 in 100
During seventh month, ...	119	6	31	82	68 in 100
During eighth and ninth month, .	96	2	22	72	76 in 100
At full term of gestation, ...	100	1	3	96	96 in 100

The reason of the greater variety in position in the early months is sufficiently obvious. Not only is the child at this period smaller relatively to the cavity which is prepared for it, but the form of the cavity itself is such, as comparatively to encourage changes of position. Until the sixth month, the cavity of the cervix not having been as yet encroached upon, in the process of development, the child is contained in the cavity proper of the uterus, or rather of the body of the uterus. All anatomists agree that, up to this period, the cavity is round and not oval, so that, as in the annexed diagram (Fig. 73), a fœtus of five months may move much more freely in any direction than is possible at the full time, when it is closely embraced by the pyriform or ovoid womb.

FIG. 73.



Uterine cavity at the fifth month.

It must be confessed, however, that the causes which lead to the presentation of the head, constitute a subject still shrouded in no little obscurity. The fact being clearly established, we see no need to pin our faith exclusively upon a single theory, particularly as it is more than probable that most, if not all of them, point to individual causes which, acting successively, or in concert, produce the effect which we have been considering. No theory quite satisfactorily accounts for the fact that the embryo assumes its ovoid form at so early a date of development. We know, of course, what Harvey first taught, that "all animals, while they are at rest or asleep, fold up their limbs in such a way as to form an oval or globular figure." This has been ascribed by modern physiologists to the greater muscular tone and contraction of the flexor as compared with the extensor muscles; but, dating from a period of development antecedent to the formation of muscles properly so-called, it is questionable whether even this will throw much light upon the point in question. In regard to the theory of gravitation, as originally promulgated, it is now sufficiently obvious that suspension by the cord cannot be the cause of the constant position at the end of pregnancy. It would be too much, however, to assume that gravity exercises no influence upon the fœtus; indeed, the experiments of Matthews Duncan and Cazeaux, point to a directly opposite conclusion. On the whole, however, we incline to the idea of reflex action, as affording the most reasonable theory which has yet been promulgated; but, far from shutting out the hypothesis of gravitation, we can conceive nothing more likely than that the vital force and the physical law act harmoniously together here, as elsewhere, at the bidding of nature.

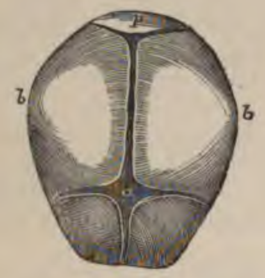
When the fœtus is abnormally situated in the womb, the walls of this organ yield, and adapt themselves to the altered circumstances of the case. The bent posture is, however, always maintained, and the fœtal ovoid is only distorted, in a marked degree, when the violent pressure of the contracting walls acts upon a misplaced fœtus. It is in the ordinary position that the ovoid is most regular and marked,—the larger pole being upwards, and occupying the expanded fundus, while the smaller is turned towards the vagina. If we take the longest, or bipolar measurement of the ovoid, at twelve inches, the broadest part of the larger end, from the lumbar region to the sole or edge of the foot, will usually be found to be about eight inches, and to correspond to the greatest transverse measurement of the cavity. Obviously, therefore, any marked alteration in the attitude or position of the child implies distortion of the outline of the womb. The fact of the smaller or cephalic end being only some four and a half inches in its larger or occipito-frontal measurement, has led to the idea which has been frequently expressed, with reference to the mechanism of delivery, that the child thus placed was a wedge, and that the smaller end dilated the parts for the passage of the larger breech. Nothing can, in point of fact, be more erroneous than this, or more likely to lead to serious practical blunders. For we find, that when the large end presents at the os, labor, far from being retarded, often advances, up to a certain stage, with unusual ease and rapidity,—a fact which is owing to the plastic nature of the structures of which it is composed. If it were, in any sense, a wedge, the head, or apex of the wedge, would never fail to follow the breech at once, and with ease. But as it does not, and is often extracted only after much suffering, and at great risk to the child, we cannot admit the simile to be a happy one. The fact is, that the smaller end of the ovoid is the really formidable structure in the act of parturition, from its comparatively unyielding nature,—due to the special means which are adopted for the protection of the important nervous centre, upon the integrity of which the life of the infant depends. When the head has passed in safety, it is rarely, indeed, that there is any difficulty in the birth of the other parts. To the obstetrician, therefore, one of the most important practical points in the study of his art is the thorough comprehension of the fœtal cranium, and more especially of its relation to the pelvis, and to the other maternal structures which we have already fully described.

The Fœtal Cranium.—The bones which compose the cranium and face are found, at the period of delivery, to have reached different stages of development. With a view, no doubt, to the perfect protection of the important organs at the base of the brain, the bones which form the base of the cranium, and the greater part of the face, are already so fused together as to admit of little or no movement. It is different, however, with the flat bones of the vault. The subjacent parts of the great nervous centre, being less essential to life, admit, with perfect impunity, of a certain amount of compression; and, in order that full mechanical advantage may be taken of this circumstance, the ossification of the flat bones is comparatively imperfect. The various parts of which the cranium is composed are, of course, familiar to every student of anatomy. It will suffice, therefore, to notice those points only which are of special obstetrical interest.

The Sutures are, first, the *sagittal*, which runs along the vertex, from the anterior to the posterior fontanelle. In continuation of this, there runs forwards a suture, which is peculiar to early life, and which is described by some writers as a part of the sagittal suture. This, which divides the frontal bone into two equal parts, is usually named the *frontal* suture. The *coronal* suture marks the line of demarcation between the frontal and parietal bones; while the *lambdoidal* suture runs outwards and downwards, from the posterior fontanelle, separating the posterior margin of the parietal from the occipital bone, and having thus the appearance of a bifurcation of the sagittal suture posteriorly, it presents some resemblance to the Greek letter from which it takes its name. At the base of each parietal is the suture which unites it to the corresponding temporal bone.

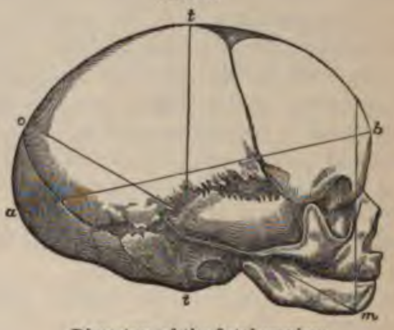
The ossification of the bones, at all these points of contact, is so incomplete as to admit of very considerable motion; and in some situations,—as at the sagittal suture,—the bones overlap each other to such an extent that, by reducing certain diameters, a great mechanical advantage accrues in the act of parturition. The angles of the bones are the points at which the development is least advanced, and it is here that certain gaps are left, where membrane only intervenes between the scalp and the brain, and through which the pulsations of the latter may be observed. These gaps are called the Fontanelles. The largest, the *great* or *anterior* fontanelle, or *bregma* (Fig. 74, *a*), is irregularly lozenge-shaped, of considerable size, and easily recognized by the finger during labor. The larger portion of it is in front of the coronal suture, whence it is sometimes continued forwards, almost to the root of the nose. The *posterior* fontanelle (*p*) is very much smaller, and is triangular in shape. As the occiput is almost always turned forwards, it is this fontanelle which the finger usually touches in an examination during labor; but in well-developed crania, and more especially where overlapping of the sutures has taken place, it scarcely merits the name of a fontanelle, but is rather a point at which the lambdoidal and sagittal sutures meet. In a digital examination, it is of importance that the accoucheur should be able at once to distinguish between these fontanelles, for it is mainly by marking their situation that he is enabled to recognize the exact position of the head. At first, the student will find some difficulty in ascertaining this, but a little care and attention will soon enable him to overcome the trifling difficulty; and he will find it useful, when in doubt, to run his finger round the gap, and count the sutures which run into it:—in the case of the anterior fontanelle, these are *four* in number, and, in that of the posterior, *three* only. The tumefaction of the scalp, which is so common an occurrence in difficult labor, may render such an examination difficult; but in the absence of this, the only circumstance which might mislead him, on a hurried examination, would be the presence of the irregular bones, called *ossa triquetra*. Some writers describe lateral fontanelles at the inferior angles of the parietal bones, anteriorly and posteriorly, but these are so covered in by the temporal muscles, that it is only under very exceptional circumstances that their observation can be of any practical moment.

FIG. 74.



Upper surface of fœtal cranium.

FIG. 75.



Diameters of the fœtal cranium.

It must now be obvious that a correct knowledge of the size of the cranium, and the relation which it bears to the pelvis in its various diameters, must in no small measure be our guide to intelligent and skilful practice. Numerous measurements have been taken of the fœtal cranium, for the most part between points arbitrarily selected. It is, however, only the most important of these diameters with which the memory need be charged, viz., the *occipito-frontal*, the *occipito-mental*, and the *biparietal;* and, in addition to these, we shall mention only the *trachelo-bregmatic* and the *fronto-mental.*

The Occipito-frontal, or long diameter of the oval cranium, is an imaginary line, extending from the frontal eminences anteriorly to the occiput posteriorly. It is somewhat doubtful what some authors mean in this case by "the occiput," but there is no doubt that most modern writers, who are exact in the matter, describe it as terminating at the summit of the occiput, or, in other words, at the posterior fontanelle. If, during labor, the position of the head in relation to the trunk were the same as in an adult in the erect posture, this would doubtless be correct. But if we recall the fact that the chin of the child is applied to the sternum, and that the occiput passes into the pelvis considerably in advance of the forehead, it seems more correct to adopt the view of Cazeaux and some others, and draw our line (Fig. 75, *a b*) to the occipital protuberance. The actual measurement, it is true, is only fractionally greater, but the line indicated is certainly more nearly in coincidence with the plane of the pelvic brim and the upper part of the cavity than that which is usually described.

The occipito-mental is the largest of the cranial diameters, and exceeds that just described, if we make an allowance for an average amount of moulding, by about an inch. It is thus of great importance with reference to the mechanism of parturition, and is represented in the figure by the line *o m*, drawn from the point of the chin to the posterior fontanelle. The Biparietal diameter (*b b* Fig. 74), extends transversely from one parietal protuberance to the other. The Trachelo-bregmatic, *t t*, is from the posterior extremity of the anterior fontanelle to the anterior margin of the foramen magnum; and the Fronto-mental, *b m*, from the level of the frontal eminences to the point of the chin. Most of these diameters will be increased or diminished in direct proportion to the amount of pressure to which the head is subjected, and the consequent degree of moulding which it undergoes. It is, on that account, extremely difficult to state averages. But, besides, the recognized difference which subsists between male and female crania, not to speak of the varieties depending on race, still further increase the difficulty. Taking, however, the average of male and female crania in Europe, the following measurements probably come very near the truth—if, at the same time, we make due allowance for average moulding, which, if we are to estimate the size of crania at the moment of birth, must certainly be done.

Average measurement of male and female Fœtal Crania:

Occipito-frontal diameter,	4½ inches.
Occipito-mental "	5¼ "
Biparietal "	3½ "
Trachelo-bregmatic "	3¾ "
Fronto-mental "	3½ "

It is scarcely necessary to add that these measurements refer to cases in which the head is born in the occipito-anterior position. In other cases of abnormal or unusual position, the moulding will be modified to suit the requirements of the case, and the diameters will thereby be relatively altered. The same remark applies to circumferential measurements, which are usually stated, as regards the occipito-frontal circumference, as about fourteen inches, and for the occipito-mental as sixteen inches. According to Dr. Tyler Smith, "the ordinary presenting circumference, which passes under the occiput, and round the parietal bones to a little behind the bregma, is about eleven and a half inches."

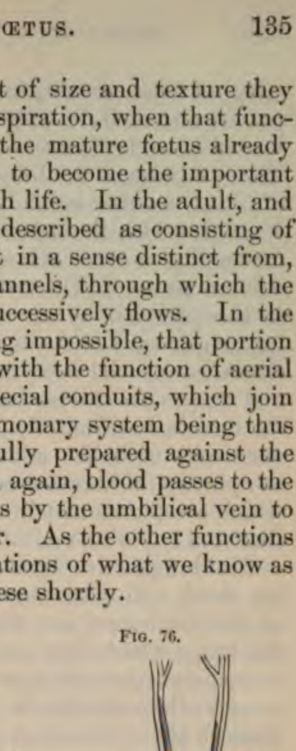
In descriptions of fœtal crania, and of cranial positions, the term "vertex" is constantly adopted by English and American writers. Unfortunately, however, this is one of several terms which are so loosely used that it is necessary to give a definition before venturing to employ them. It is described in Todd's Cyclopædia as synonymous with the anterior fontanelle; by Dr. Ramsbotham as a point a little in front of the posterior fontanelle; by Smellie as the whole space between the two; and by Schmidt as a point midway between the anterior and posterior fontanelle. Of all these the most usual description is that which places the vertex in or close to the posterior fontanelle. The expression "crown" or "vertex" implies that portion of the head which is highest in the erect posture. If so, the vertex can neither be the anterior nor posterior fontanelle, but a point intermediate between the two, varying somewhat according to the peculiar formation of different crania, so that it is difficult to determine the exact *point*. If it were absolutely necessary to describe it as such, we should probably closely approach the truth by placing it with Schmidt at a point midway between the two fontanelles. But if we consider the infinite varieties which obtain in the comparative position of the two fontanelles, as regards the pelvic axes, so that any one point of the sagittal suture may in certain cases present, it then becomes obvious that to the term vertex we must attach a more extended signification, if we would avoid complicated systems of classification. On these grounds we prefer the definition of Smellie, and shall use the term vertex as including the sagittal suture in its whole length, and on either side that portion of the parietal bone (once called *os verticis*) which lies between the suture and the protuberance.

Functions of the Fœtus.—The Fœtus being, during the whole period of its intra-uterine life, separated from the outer world, and immersed in a liquid medium, those functions which, after birth, are discharged under the usual atmospheric condition, and in consonance with the ordinary laws of nutrition, fall to be performed after a fashion adapted to the peculiar circumstances of the case. We find, therefore, that, in the absence of aerial respiration, certain special modifications of the circulatory apparatus have been adopted, with the view of affording that gas to the blood, and that nutritive material to the frame, without which life within the womb would be a physical impossibility. A knowledge of this subject is essential both to the physiologist and to the accoucheur, and it is only in the light of such knowledge that certain morbid phenomena and faults of development can be understood, and possibly, in some instances, obviated.

The life of the fœtus is maintained by an intimate union between the maternal and fœtal circulatory systems, a union in which, although there is no junction of the two currents, there is ample provision for the mutual interpenetration of gases and fluids, and also for the interchange of cell elements. We do not allude now to the laws which regulate the development of the early embryo, but to the union which subsists after the development of the organs of connection which have already been described, and which exist in almost all the Mammalia. The lungs of the fœtus are, up to the moment of birth, apparently rudimentary. We say "apparently," because, although in point of size and texture they present little resemblance to the organs of respiration, when that function has once been established, they are in the mature fœtus already perfect in structure, and only await inflation to become the important organs, the function of which only ceases with life. In the adult, and dating from birth, the circulation is usually described as consisting of two tracts, mutually dependent upon, and yet in a sense distinct from, each other, the systemic and pulmonary channels, through which the whole column of blood continuously and successively flows. In the fœtus, however, the function of the lungs being impossible, that portion of the circulatory current which is associated with the function of aerial respiration, is diverted from its course by special conduits, which join the circuit at a more advanced point, the pulmonary system being thus practically *nil*, although its apparatus is fully prepared against the moment of birth. From the systemic vessels, again, blood passes to the placenta by the umbilical arteries, and returns by the umbilical vein to join the general venous system of the mother. As the other functions of the fœtus depend chiefly upon the modifications of what we know as the adult apparatus, we may here describe these shortly.

The Fœtal Circulation.—The blood which returns from the placenta by the umbilical vein (Fig. 76, *d*), is charged with oxygen derived from the mother, so that the term "venous blood" is here, in its ordinary sense, inapplicable. After passing through the umbilicus, the vessel divides. A portion of its contents enters the liver, along with the blood which is being returned from the intestines by the vena portæ (*g*), and, after circulating in that organ, enters the vena cava at *h*. The greater portion of it, however, passes direct to the vena cava, by the *ductus venosus* (*a*), which joins the main trunk at a point a little lower than the hepatic vein. The blood, being thus mixed with the systemic venous current, arrives at the heart much more feebly oxygenated than it was at the umbilicus, and, passing into the right auricle, is directed by the Eustachian valve towards the *foramen ovale*, a special aperture through which the blood from the inferior cava is transmitted to the left auricle. From this point the current passes to the left ventricle, and from thence, as in the adult, to the aorta, almost the whole of this supply proceeding to the head and superior extremities by the three great vessels of the aortic arch, to return again to the right auricle by the superior cava. Although a mixture of the two currents from the venæ cavæ

FIG. 76.



Circulatory apparatus in the fœtus.

must, to some extent, inevitably occur, the blood of the superior vein passes, almost in its entirety, through the tricuspid valve into the right ventricle, and thence to the commencement of the pulmonary artery. The condition of the lungs not being such as to receive this large column of blood, another special structure, the *ductus arteriosus* (*r*) is interposed, through which the current is diverted, and conducted directly into the descending aorta. Along with a little blood from the left heart, this column passes downwards to the lower part of the body, most of it going to the placenta by the umbilical arteries, from whence, charged with oxygen, it again returns to the vena cava inferior. It will be observed that three special conduits thus exist; two of them, the foramen ovale and ductus arteriosus, being designed with the direct object of diverting the circulation from the lungs, while the other serves to connect the vena cava with the umbilical vein. In addition to these, which are completely obliterated after birth, there are the umbilical arteries, which are permanent in a portion of their course, forming the internal iliac and superior vesical arteries.

The lungs enter upon their function immediately upon the birth of the child, and when anything occurs to prevent the speedy occurrence of the respiratory act, the child is still-born. The sudden inflation of the lungs which thus occurs, and the arrest of the placental circulation, consequent upon the separation of that organ from the mother, give rise to immediate changes in the direction of the current, which are the first steps in the obliteration of the special fœtal structures which have been described. The essential phenomenon is the transference of the seat of respiration from the placenta to the lungs. By the consequent development or unfolding of the pulmonary vessels, a vacuum is created, which draws the blood from the right ventricle directly, and for the first time, into the pulmonary circuit. The aorta, lacking thus the important source of supply which it had hitherto derived from the ductus arteriosus, sends a diminished supply of blood in a feeble stream to the umbilical arteries, thus encouraging the stasis of the blood in the fœtal portion of the placenta. This causes a diminution, and soon a complete cessation, of the flow of blood outwards through the umbilical arteries, and of its return through the umbilical vein. When the left auricle is sufficiently supplied, by the return of the blood from the lungs through the pulmonary veins, the foramen ovale is closed by the pressure of the blood upon its valve, the closure being further encouraged by the diminution in the supply of blood to the right auricle, which is the necessary result of the arrested circulation in the umbilical vein. These facts make it clear how important it is for the mechanism of the circulation that the establishment of aerial respiration should be simultaneous with the arrest of the placental circulation. It is only upon the complete establishment of the pulmonary circulation that the distinction between arterial and venous blood can, with perfect propriety, be drawn. There is no longer a mingling of the two currents, and they now assume, within their proper vessels, the physical characteristics which serve to distinguish them.

The time at which the obliteration of the fœtal apertures takes place, and the order in which they close, are facts of some medico-legal importance. Effective closure, if not obliteration, of all of them, will generally be found to have occurred by the ninth day, although they may remain patent for twelve or fifteen days, or even longer, without any inconvenience to the child. The umbilical arteries are usually impermeable from the second day, owing to contraction and thickening of their walls; the vein and ductus venosus always close after the arteries, generally about the sixth or seventh day. The ductus arteriosus and foramen ovale are the last to be obliterated, but rarely remain permeable longer than the period above stated. In regard to the latter, it has been said that, while it is the last to close, it is the first to contract. In the embryo, there is but one auricular cavity, but about the third month a semilunar valve, containing fleshy fibres, marks the first growth of the partition which ultimately separates the right from the left auricle. Permanence of the aperture may constitute the affection known as Cyanosis. Dr. Tyler Smith is of opinion that the closure of the fœtal apertures is, in a great measure, due to the mechanical effect of the inflation of the lungs; and there can be little doubt, we believe, that this contributes to the result, by the pressure which is exercised, in the one direction, by the right bronchus, upon the ductus arteriosus, and, in the other, by the displacement downwards of the liver, upon the umbilical vein and ductus venosus. The changed position of the heart also tends to the closure of the foramen ovale. Another very marked result of the alteration in the circulating system —one which acts somewhat more slowly—is the thickening of the walls, and augmentation in the capacity, of the left heart, which, prior to birth, is subordinate to the right heart in both of these particulars. In three or four weeks this change is very obvious.

The blood of the mature fœtus does not differ materially from that which occupies the vessels after birth; but owing, no doubt, to the comparatively imperfect arterialization which takes place in the placenta, and the manner in which the two systems mingle, there is not observed that contrast in color which enables us to distinguish arterial from venous blood. As regards the blood of early embryonic life, few opportunities occur in which it can be examined; but, from what has been observed, it would appear that it is of a dark color, coagulates feebly, is deficient in fibrin, and becomes but little reddened on exposure to the atmosphere.

Respiration.—From what has just been said in reference to the course of the circulation of the blood in the fœtus, it will be obvious that the respiratory function must be carried on in the placenta—the most important of whose functions, indeed, is that of an intra-uterine lung. We need not pause here to discuss exploded theories as to the source from which oxygen is derived by the fœtus. The researches of Bischoff proved that, even in the embryo, respiration by means of the branchial fissures is impossible, and that, in point of fact, these structures have no connection whatever with this function, as was at one time erroneously supposed by Geoffroy Saint-Hilaire and others. Two facts stand out prominently: First, that a constant supply of oxygen is necessary to the life of the fœtus; and second, that that supply cannot be obtained directly from the air. Whence, then, is it derived?

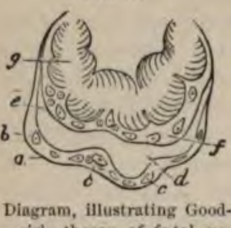
The full description, which was given in a former chapter, of the structure of the placenta, may suffice for an answer to this question, in so far as regards that period of intra-uterine life during which the placenta exists. But, for the period of embryonic life, some further description is required; and, indeed, there is still, in regard to this point, some necessity for extended research. M. Serres has described two periods,—the first of these, which he terms the period of *branchial* respiration, exists down to the time when the placenta is formed. He assumes that, among the villi of the chorion, there are a certain number (*villosités branchiales*) which dip into the lacunæ of the decidua reflexa, and are there bathed in a special fluid, from which the supply of oxygen is derived until, in the course of development, the second, or placental period arrives. To what extent, if at all, this theory may be admitted as correct, it is at present impossible to determine; nor would it serve any good purpose to enter here upon the discussion of this, or any mere physiological speculation. We shall at once, therefore, assume, as facts hitherto observed entitle us, that from the earliest period at which the necessity of a respiratory function may arise, the essential supply of oxygen is derived from the mother, and passes through the external surface of the ovum, the villi of the chorion, or the villi of the placenta, according to the stage of actual development. The function of respiration involves the interchange of gases; but whether this interchange takes place in consonance with the laws which regulate interpenetration of fluids, or by passing through some intermediate vehicle, as is presumed by Serres, the source of the supply may, in all cases, be assumed to be the same. In point of fact, the respiration of the fœtus bears the strictest analogy to the branchial respiration of fishes, in which a membranous structure only is interposed between the blood and the liquid from which the oxygen is to be derived. In the placenta, as we have seen, the parts are so disposed as to bring as large a portion as possible of the two systems, maternal and fœtal, into contact.

That, in consequence of this contact, the blood undergoes important and vital changes is proved by many facts, pathological and otherwise. To compress the cord, is to cause the certain death of the fœtus; but more significant even than this is the fact, that after death from this cause, the physiological phenomena of apnœa are invariably developed. There exists, also, a marked respiratory antagonism between the placenta and the lungs. So long as the placental circulation is still uninterrupted, the new-born infant may live without pulmonary respiration, but, so soon as it breathes strongly, the blood no longer passes by the cord, or if it persists to a certain extent, it may at once be stopped by ligature. But if the child has not breathed, it is always wrong to tie a pulsating cord until aerial respiration has been set up. Finally, the respiratory function of the placenta has been proved by analysis of the blood from the umbilical arteries and veins, that in the vein always showing a comparative abundance of oxygen, although, as already mentioned, the quantity of the gas is not sufficient to establish that marked difference in color which enables us so readily to distinguish between ordinary arterial and venous blood.

Nutrition.—This function is intimately associated with that of respiration. All modern physiologists admit that the nutritive supply comes from the mother, but the exact manner in which it is absorbed, and the proportion in which it passes through various channels and media, are points which have given rise to endless disputes, and many hypotheses. It is certain that the nutritive material cannot, at all stages of embryonic and fœtal development, pass through the same course in its way from mother to child; and, in truth, our knowledge of the history of development prepares us for the admission that the plan of nutrition must differ materially according to the stage at which the fertilized ovum has arrived. Even at the very earliest stage, while it still moves freely in the Fallopian tube, absorption from maternal sources may take place by endosmose through its external envelopes, which also admit of penetration by the fertilizing sperm of the male. But, in addition to this, there is a store of material, which we have reason to believe is in a great measure nutritive, contained in the umbilical vesicle. The quantity of this, and the proportion which it bears to the size of the embryo, is at first very great, but as changes succeed each other within the ovum, in the manner already described under the head of Development, the relative quantity dwindles, and the reservoir itself becomes ultimately absorbed, after being drained of its contents. The connection of the umbilical vesicle with the rudimentary intestine, the chemical composition of its contents, and, more significant still, the establishment in its walls of bloodvessels, proceeding from the fœtus, suffice to prove this position. The only other possible channel through which material may, at this stage, reach the embryo, is through the vitriform fluid, which occupies the interval between the chorion and the amnion. After the development of the allantois, vessels are carried from the embryo to the chorion: the villi of the latter become enlarged and vascular, implant themselves in the decidua, and thus bring fœtal vessels and fœtal blood into the closest contact with the mother. Some have even believed that the villi plunge into the utricular follicles, and thence derive their pabulum.

With the formation of the placenta, this contact becomes localized, and at the same time, owing to the peculiar structure of that organ, is greatly increased in extent. Through the delicate membranes which separate the one system from the other, and in addition to the gaseous supply which constitutes the respiratory function of the placenta, there pass incessantly, in fluid form, materials which go to the building up of the fœtal tissues. But it is not alone by a mere endosmose, or by mutual interpenetration, that this nutritive function is carried on, but by a process of intermediate cell-growth, in the course of which, materials are elaborated, with the express object of fœtal nutrition. Goodsir's theory on this point is illustrated by the accompanying diagram (Fig. 77). His observations led him to the conclusion that the blood, in the vessels of the mother, is separated from that in the vessels of the

FIG. 77.



Diagram, illustrating Goodsir's theory of fœtal nutrition.

fœtus by the intervention of two distinct sets of nucleated cells. One of these, *c*, belongs to the maternal portion of the placenta, lies in contact with, and external to the ultimate maternal vessels, and is probably designed for the separation from the blood of the mother of the materials destined for the fœtus. The other layer, *f*, lies between the membrane of the fœtal villus and the wall of the vascular loop which it contains, the object of these cells being to receive the material which has been elaborated on the other side. Between the two there is a space, *d*, into which the materials secreted by one set of cells is poured, in order that it may be absorbed by the other. In this way, it is probable that not only are materials passed from the mother to the fœtus, but, that through the same agency, effete or excrementitious matters are transferred from the fœtal to the maternal blood.

Another source from which nutriment may be drawn is the liquor amnii. Substances introduced into the stomach or blood of the female have been found in this medium, as well as in the fœtus and placenta, and its analysis has proved it to contain albumen, osmazome, and salts. Besides this, newly born calves have been kept alive by fresh amnionic fluid during a period of fifteen days. This being the case, many theories have been advanced, with the view of proving that nutritive material passed by this channel from the mother to the fœtus. The mammary glands, the genital organs, and the alimentary canal, have all been upheld as constituting the mediate channel of communication, but there can be little doubt that such communication, if it occur at all, is most likely to take place through the entire cutaneous surface. This idea is confirmed in an especial manner by the observations of Brugmans, who found, on removing the embryo from the amnionic pouch in living animals, that the lymphatic vessels of the skin were in an engorged condition, while those of the intestines, the functions of which had yet to be established, were found to be empty. If we admit that these facts establish the belief of nutrition through the liquor amnii, we see no reason to doubt what Scanzoni asserts, that a similar absorption may take place through the walls of the umbilical cord, and that this would be a more direct way than any to the main channel of the fœtal circulation. Beyond all doubt, however, the main source of nutritive supply to the fœtus is the placenta, while the liquor amnii may be looked upon as an auxiliary medium, through which, possibly, certain special elements may be admitted.

Secretions.—The secretions of the fœtus are similar in their nature to those which are found after independent existence has been established, but are, according to the period of development, in a more or less rudimentary condition. It is necessary to mention here three only, the Bile, the Urine, and the Meconium.

The Liver is, in proportion to the size of the fœtus, and in comparison with the same organ in adult life, a viscus of great size. Prior to the fifth month, its structure is soft and pulpy, and the gall-bladder has the appearance of a white cord; but about this period the secretion of the bile commences, the characteristic structure of the liver becomes developed, and the gall-bladder commences to distend. Besides acting as an assimilating organ, by preparing materials for the blood and the tissues, its proper secerning function is to separate the hydrocarbonaceous portion of the protein compounds, and this function it discharges in the fœtus, with special and increasing energy, after the placenta has been fully formed, most physiologists being of opinion that it is by this channel, and not through the placenta, that the carbon and other effete materials are chiefly removed. At the end of the seventh month, the gall-bladder will usually be found distended with bile, and a considerable quantity of its contents, charged with carbon, makes its way into the intestine.

The name *Meconium* is that which has been given to the excremental materials which are contained in the alimentary canal of the fœtus. Up to the third month, the inner surface of the canal presents a slight moisture, but about this period the stomach and duodenum contain a small quantity of whitish albuminous fluid. At the beginning of the sixth month, the contents of the small intestine will be found to have assumed a deep yellow color, owing to the admixture of bile, which gradually becomes darker in hue as pregnancy advances. It now enters the great intestine, and ultimately, about the end of the term, occupies the rectum in considerable quantity, from whence it is ejected in presentations of the breech, and under various other circumstances which need not be here detailed. The meconium, then, is the result of a mixture of fœtal bile with the material secreted by the mucous membrane of the digestive canal.

The Urine is secreted at an early period of intra-uterine life, when the structure of the kidneys is already very considerably advanced. It was at one time supposed that the bladder communicated directly, by the urachus, with a cavity in the allantois, which thus constituted a reservoir for the urine. The allantois, however, in man at least, no longer exists as a cavity at the period when the kidneys form and the secretion of urine begins, so that we are forced to believe that the urine must be evacuated into the amnionic cavity, a fact which seems to have been established by the discovery of urinary materials in the liquor amnii.

CHAPTER VIII.

PREGNANCY: SIGNS OF PREGNANCY.

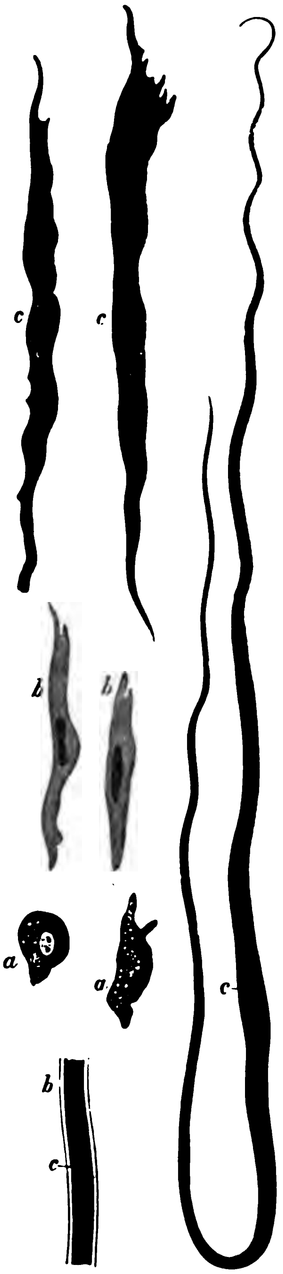
PREGNANCY—THE GRAVID UTERUS: MUSCULAR FIBRES OF: MUSCULAR LAYERS—CHANGE IN FIBRES AFTER DELIVERY—DEVELOPMENT AND ANATOMICAL RELATIONS OF UTERUS AT VARIOUS STAGES OF PREGNANCY—SIGNS OF PREGNANCY—SUPPRESSION OF THE CATAMENIA—DIGESTIVE DISORDERS: MORNING SICKNESS: SALIVATION—KIESTEIN—CHANGES IN THE MAMMÆ: PAIN: ENLARGEMENT: SECRETION OF MILK: AREOLA: CHANGES IN NIPPLE, AND IN GLANDULAR FOLLICLES: SECONDARY AREOLA—ENLARGEMENT AND EXTERNAL APPEARANCE OF ABDOMEN: FLATTENING IN EARLY MONTHS: CHANGE IN THE APPEARANCE OF UMBILICUS: DIAGNOSIS OF OTHER ABDOMINAL TUMORS—VAGINAL EXAMINATION: COLOR: DIGITAL EXAMINATION: VAGINAL PULSE.

WHILE the ovum undergoes, in the progress of its development, the changes which have been detailed, the organism of the mother is also the seat of important anatomical changes and physiological phenomena. Among these, the changes which occur in the uterus naturally attract very considerable attention.

The Gravid Uterus, when we compare it with the unimpregnated organ, presents alterations, not only in magnitude, but in structure. Nothing could be more erroneous than the idea of the old physiologists that its development was a mere distension, similar to what takes place when we inflate an India-rubber bottle. There is, on the contrary, an increase in the quantity of its tissue, whereby its weight is progressively increased up to the end of pregnancy; and there is, moreover, an alteration in the tissues of which it is composed, raising its structure, so to speak, to a higher physiological level. The changes which the mucous membrane undergoes have already been incidentally referred to in connection with the formation of the decidua. In regard to the tissue proper of the uterus, we have found it, in the unimpregnated state, to be composed of interlacing fibres, which are somewha irregularly disposed. Had no opportunity ever existed of examining these fibres in a gravid womb, it would perhaps have been held a bold speculation to maintain that these fibres are muscular elements of th non-striated variety. In the present state of histological science, nothing is more clearly demonstrated than that this is the case, even if th expulsive contractions of the uterus had not pointed to a similar conclusion. This is indicated with great distinctness in the accompanying illustration, where *a*, *a*, are nucleated fibre-cells from the unimpregnated uterus. Their embryonic or undeveloped condition shows i marked contrast with cells from the gravid uterus, which are shown i *b b*, *c c*, and *c*, at different stages of development.

These fibres, which constitute so large a portion of the bulk of the womb, have, from the time of Vesalius, been described by anatomists as forming layers, but the contradictory statements made on this subject by the earlier anatomists serve to show, what may very easily be seen by examining the uterus for ourselves, that the fibres are far from being regular and distinct in their course. This is more especially the case with regard to the unimpregnated uterus; but when conception has occurred, and the fibres have reached the higher stage of development figured above, not only are the fibres themselves more distinct, but their disposition in layers becomes more apparent. It must be confessed, however, that not even the careful dissections of Hunter and Madame Boivin, nor the microscopic researches of Kölliker, have as yet clearly demonstrated what is the exact arrangement of these layers. It may be asserted, no doubt, in general terms, that the fibres are irregularly disposed, in this as in the other hollow viscera, so as to form an external or longitudinal, and an internal or circular group; but when we come to look at the actual drawings upon which these statements are based, we cannot fail to be struck with the fact that, as regards the outer layer, a very small proportion only of the fibres can be truly described as longitudinal. The accompanying cut (Fig. 79), shows the posterior surface of the uterus, from which the peritoneum has been carefully removed, so as to exhibit the external layer of the muscular tissue. It will be observed that the fibres appear to proceed from the sides of the uterus, where they are continuous with those which pass along the round ligament, the broad ligament, the ligament of the ovary, and the Fallopian tube. Their direction, therefore, is, in the main, transverse, and when they reach the middle line, some of them pass across, interlacing with their fellows of the other side; while a certain number, according to Cazeaux, turn upwards and downwards, after interlacing, to form the band of longitudinal

Fig. 78.

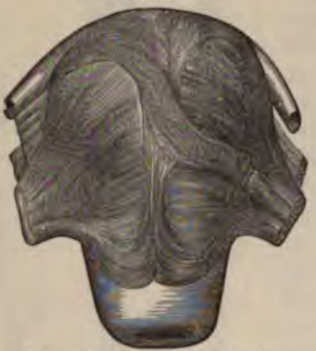


Fibre-cells of the unimpregnated and gravid uterus contrasted.

fibres which is shown in the figure, and which is continuous with numerous powerful bundles passing over the fundus. A somewhat similar disposition of fibres is seen on the anterior surface.

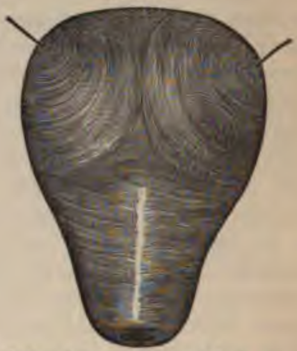
The inner layer, as described by William Hunter, and before him, though much less accurately, by Ruysch, is that which corresponds to the circular layer of the other viscera. It is thin, and composed of groups of fibres, the general direction of which is transverse, but arranged at either angle of the uterus, in a concentric manner, around the orifices of the Fallopian tubes, as shown in Fig. 80. Other groups encircle the middle of the body of the uterus, while others again are described as forming a sort of sphincter surrounding the os uteri. Between these two layers, a third or middle layer is generally described by modern anatomists, as being of considerable strength and thickness, with numerous bundles, flattened, and running in all directions in the substance of the organ. These interlace freely, and surround the vessels of the uterus, so that, when the organ is in a state of contraction, these vessels must be notably diminished in their calibre. Indeed, there is every reason to believe that it is mainly by their agency that hemorrhage is prevented after the separation of the placenta, the ruptured and gaping orifices of the utero-placental vessels being thereby closed.

FIG. 79.



External muscular layer of uterus.

FIG. 80.

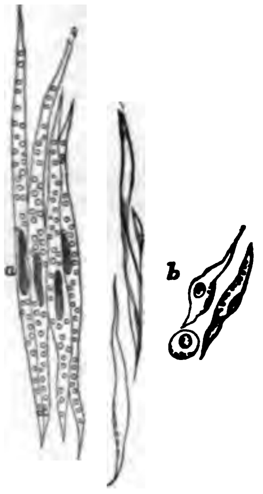


Internal muscular layer of uterus.

Inseparably connected with the subject which we are now considering, is that of the *involution* of the uterus, or that process whereby the organ returns, after delivery, to a size and structure approaching that of the unimpregnated state. That the uterus, in a short time, is reduced in weight, from about twenty-four ounces to two, involves the certainty that rapid absorption takes place under very special conditions. How this takes place has been indicated by many physiologists, but by none has it been demonstrated so clearly as by Kölliker. The enormous fibre-cells which exist at the termination of pregnancy, are now huddled together in contraction, and, their function being over, absorption takes place, under favorable conditions, with great rapidity. They become the seat of rapid atrophy, and fatty degeneration, and the whole mass of the muscular tissue becomes soft and friable. The separation of individual fibres for microscopic examination is, on this account, not easy; but, if successfully removed, they will be found as represented in Fig. 81, where the appearance presented by them a fortnight after delivery is shown at *a*. About the fourth week, the development of new fibres in various stages, *b*, may also be observed. A large portion of the fatty and disintegrated matter is removed by the vagina in the lochial discharge; and a proportion still larger is probably absorbed into the circulation, and discharged ultimately from the system by the ordinary excretory channels. The latter has been supposed to contribute to the formation of the caseous matter in the milk first secreted.

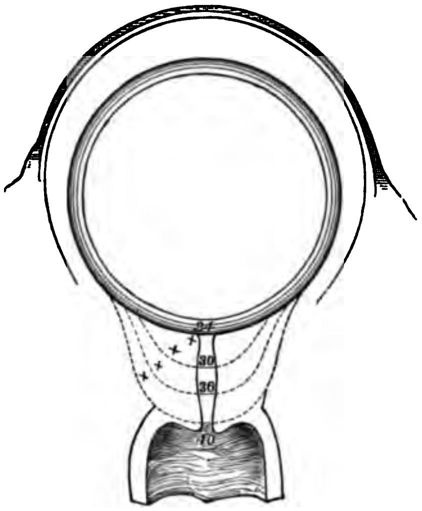
That portion of the peritoneum which invests the uterus and neighboring parts, is evidently so disposed in the unimpregnated state, as to admit of free extension during pregnancy. It is in this way that the broad, as well as the anterior and posterior ligaments unfold themselves, as the uterus slowly develops, until, at last, they entirely disappear. But it is not by a mere mechanical process such as this, that the serous covering of the womb adapts itself to the exigencies of the pregnant state, but, in addition, by an actual hypertrophy of its tissue. Were the former alone the case, the extension thus furnished would not be possible without thinning of the membranes; but as we invariably find that, at the very end of pregnancy, the membrane in question is as thick as before, we infer, that in this case, as in large herniæ and certain other morbid conditions, the serous, as well as the muscular and mucous coats of the womb, undergo marked hypertrophy.

FIG. 81.



Degeneration of fibre-cells after delivery.

FIG. 82.



Diagram, showing development of uterine cavity. (After Schultze.)

The development of the ovum within the womb, the various stages of which we have traced, is necessarily accompanied by a corresponding increase in the volume of the uterus, and by marked changes in its anatomical relations. In the shape of the organ, there is, from the first weeks, a marked alteration in respect of the antero-posterior flattening; and, as the pregnancy advances, the general form approaches more a spheroidal than a pear shape. From the twelfth to the twenty-fourth week, the cavity assumes more and more of a rounded appearance, but still retaining a certain amount of the antero-posterior flattening, and its length is also somewhat greater than its width; but, speaking in general terms, the cavity of the uterus may, at the last-named period, be described as it is shown in the diagram (Fig. 82), as circular. During the remaining sixteen weeks of gestation, the rounded shape of the uterine cavity becomes changed into an oval, so that at the end of pregnancy the womb is about twelve inches long, nine broad, and eight from before backwards. This change is brought about by an invasion of the canal of the cervix, which takes place now for the first time, and which acts from above downwards. The numbers, 30, 36, and 40, are intended to represent, by the dotted lines, the extent to which, at these weeks, the uterine cavity has increased at the expense of the cervix. The crosses mark upon the uterine wall the site of the original os internum. To this subject, and more particularly to the state of the os and cervix as a sign of pregnancy, we shall revert.

These alterations in the form of the uterus, must needs be accompanied by changes, no less marked, in its situation and anatomical relations. During the first twelve weeks of gestation, the womb remains within the true pelvis, or cannot, at least, be felt above the pubis. Seeing that the fundus is originally very near the level of the brim, it follows that the considerable increase in bulk which these weeks bring must find room in another direction. We find, therefore, that the development, under the circumstances, goes on in a downward direction, and that the os and cervix are found, on examination, to be much nearer the floor of the pelvis than they were before impregnation. It thus obeys, so far, the laws of gravity, and the weight of the intestines resting upon the fundus may, in some measure, contribute to the result. The progress of fœtal growth soon renders it impossible for the uterus and its contents to remain longer within the pelvis; and if, under peculiar circumstances, it be so, the safety, both of mother and child, is immediately endangered. The presence of the rectum on the left side is assumed by many to be the cause of a change in the anatomical relations of the uterus, which very generally takes place, and which consists in a deviation of the fundus to the right side. In the course of the fourth month, the fundus can usually be felt by the finger of the accoucheur, above the pubis. The level which it attains at various periods of pregnancy depends upon the condition of the abdominal walls, and upon many other circumstances which render exact statements upon this subject impossible. Very generally, it will be found to have attained the level of the umbilicus some time in the course of the sixth month. About the thirty-sixth or thirty-seventh week, it reaches the level of the xiphoid cartilage; but between this time and the end of pregnancy, it falls downwards and forwards, preparatory to the phenomena of parturition.

In rising from the pelvis, and going through the succeeding stages of its development, it is easy to understand how the uterus, with a tendency towards the right side, will be still more encouraged in its movement in that direction, by the prominence of the vertebral column in the middle line. Or, if we reject the theory of the influence exercised by the rectum, we still see, in the relations which subsist between the expanding uterus and the vertebræ, a sufficient cause for deviation from the middle line. And it is certain that, in a large proportion of cases, this deviation is to the right side.[1] If we reflect that the line which represents the axis of the uterus is nearly coincident with the axis of the brim of the pelvis, and remember the marked projection of the lumbar vertebræ, we shall have no difficulty in appreciating the causes which lead to the uterus being in immediate contact with the anterior abdominal wall, so that it is a rare occurrence when we find any portion of the intestines intervening between the abdominal and uterine walls in this situation. At the termination of pregnancy, then, the uterus, with the ovaries, Fallopian tubes, and other structures closely applied to its sides, occupies a great part of the abdominal cavity. Its usual relations are as follows: In front with the vagina, the neck, and posterior wall of the bladder, and the anterior abdominal wall; behind, with the rectum and the promontory of the sacrum below, and the mesentery and the intestines above; on the right, by the cæcum and the right abdominal wall; and on the left by the sigmoid flexure of the colon, and usually the great bulk of the small intestines.

Signs of Pregnancy.—The development of the womb, and that, already described, of the germ which it contains, constitute the essential anatomical and physiological phenomena of the pregnant state. Associated with it, however, and dependent upon its continuance, are numerous other manifestations, which have their seat in organs so remote that it is difficult, in many cases, to trace the sympathy which exists between them and the special organs of generation. There is, in point of fact, no single function of the whole economy which may not be affected by the operation of a cause which has its centre in the generative organs, and which radiates thence throughout the entire system. Consequently, phenomena are frequently observed in distant organs, which are certainly not associated in function with the womb; but so constant is the occurrence of these phenomena, that they have come to be familiarly looked upon as among the early symptoms of pregnancy. More important are the symptoms which have their cause and seat in the generative organs; but in the observation even of these there are, as in the case of the others, so many sources of fallacy, so many pitfalls of error, that obstetrical writers have uniformly, and with obvious propriety, made a study of the Signs of Pregnancy—one of the most prominent objects to which it is desirable that the attention of the student in this department should be drawn. We can conceive no subject in regard to which a mistake might so utterly ruin a young man's hopes, than the determination, in delicate or doubtful cases, of this question of pregnancy. An obvious pregnancy overlooked, because the idea has never crossed the mind, is bad enough; and we have known a practitioner of thirty years' standing blister the abdomen in the ninth month, under the idea that he was treating a morbid growth. But what is far more inexcusable is the culpable rashness of those who, without irrefragable evidence of the existence of pregnancy, would venture—as has been done in high quarters—to brand a woman with the stigma of dishonor. To enable the practitioner to avoid these and similar errors, the symptoms which indicate pregnancy have been arranged, with a view, more especially, of assigning to each its actual diagnostic value, and determining the period at which, in the course of a pregnancy, it is available. We shall find that the number of symptoms, which are of themselves conclusive as evidence of pregnancy, is very limited; but the other, and more numerous group, constitute an important chain of circumstantial or corroborative links, which, under ordinary circumstances, enable us to admit the strongest probability of an event which may be either dreaded or longed for. The convictions of a woman whose most earnest desire is to be a mother, and the passionate asseverations of another whose chastity is called in question, are disturbing elements which tend to throw us out in our calculations, and must always be taken *cum grano.*

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[1] It has been held, among the causes which have been advanced to account for this displacement to the right, that the weight of the placenta gave rise to it, it being more frequently, according to Levret, on the right side. The presence of the descending colon on the left, the habitual use of the right hand in preference to the left, and the habit of lying on the right side during sleep, are a few among the many reasons which have been propounded to account for the phenomenon.

In classifying the Signs of Pregnancy, various plans have been adopted, but what seems more rational, and what certainly is much more satisfactory than any attempt at rigid classification, is to take up the symptoms, as nearly as may be, in the order in which they are manifested. The earliest of all the symptoms have their seat in the generative organs, but are of little value from a practical point of view, inasmuch as they consist in physiological and anatomical manifestations which are almost entirely beyond our ken. It is certain that the fertilized ovum, on its arrival within the cavity of the uterus, finds that organ in a condition suitable for its reception. Probably the conditions which we have seen to exist, in ordinary healthy menstruation, as regards the tissues of the womb, are, under the special circumstances of conception, prolonged, and ultimately pass, by a series of developmental changes, some of which have been described, into those which are characteristic of the more advanced stages of pregnancy. Or, supposing even the uterus to be quiescent, and not under the influence either of a past or of an impending menstrual molimen, we may assume that one of the earliest effects of impregnation is a marked congestion and hypertrophy of all the uterine structures; changes which, though easily enough demonstrated after death, are not so easily appreciated during life, and are in reality of little actual diagnostic value. Still, the increased weight and heat of the uterus, the increased resistance in the upper and anterior wall of the vagina,—due, it has been said, to a slight anteversion of the womb usual at this period,—may, along with other symptoms, excite in the mind of the experienced practitioner suspicions which, under other circumstances, might not have arisen.

Suppression of the Catamenia is generally the first symptom which attracts the attention of a woman who admits to herself the possibility of impregnation. Although this undoubtedly is a remarkably constant occurrence, it is by no means invariable. It has, however, a special interest, apart from its value as a sign of pregnancy, in the fact that it is from the last appearance of the menstrual flow that women are in the habit of calculating the probable period at which the birth of the child will probably take place. What detracts more especially from its value as an evidence of impregnation, are the remarkable aberrations which, under such circumstances, not unfrequently occur. It is far from being a very uncommon occurrence that, during the early months of pregnancy, the catamenia, or at least a periodical sanguineous discharge, makes its appearance much as usual. Cases in which this occurs up to the fifth or sixth month, are of much less frequent occurrence; and fewer still are the instances in which, from the beginning to the end of pregnancy, the menstrual discharge apparently goes on as usual. Probably, Moreau is correct in assuming that, in these cases, the source of the discharge is not the same as in ordinary menstruation; but, as regards the import of the symptom, this is a mere speculation, and of no practical significance. Cases are on record also in which women menstruated only during pregnancy, menstruated for the first time after impregnation had taken place, or became pregnant without ever having menstruated at all. The last case, which is extremely rare, is analogous to what takes place in those instances in which women who are nursing again become pregnant, without ever having menstruated since the previous accouchement. The converse of these cases, and what goes still further to lessen the value of the suppression of the catamenia as a sign of pregnancy, is to be found in the very numerous examples which occur in everyday practice, of patients in whom the discharge is suppressed, as the result of certain morbid conditions affecting, more or less directly, the generative organs. A similar result may obtain, and that even more frequently, in those instances in which the suppression is the result of constitutional causes, which are in themselves apparently quite independent of the generative functions. And, in a few rare cases, there is a suppression of the menstrual discharge without any appreciable cause, local or general, but it cannot be doubted that in these the only peculiarity is, that the cause is hid from us. It should be remembered, as a fact of by no means very rare occurrence, that newly married women may cease to menstruate during several periods, as a result apparently of mere sexual excitement unconnected with impregnation. It is in the highest degree probable that these deviations from the normal standard, are due to unusual conditions of the ovary, which in the first class of cases we may venture to assume as being unduly stimulated to attempts at ovulation, during a period at which that function should naturally be in abeyance; while, in the latter, its function is arrested by causes which may act upon the ovary, either specially through the generative apparatus, or constitutionally through the general system.

The Digestive Organs are, during a pregnancy, the seat of various derangements of function, evidently depending on the sympathy which subsists between these upon the one hand, and the womb on the other. Although the exact period at which such symptoms develop themselves varies greatly, there is scarcely a single case in which, at some time or other, symptomatic digestive disorders do not manifest themselves. The most frequent of all is nausea, generally accompanied with vomiting, and this symptom being of much more frequent occurrence in the morning than at any other time of the day, has given rise to the name *morning sickness.*

In the absence of any special cause which might give rise to nausea or vom iting, and if the general health apparently remains good, this sign is sometimes of considerable value. It is generally, however, to the early months that this nausea is limited, and it usually terminates or is mitigated about the time that the fundus may be observed above the pubes, having commenced probably about the fourth or fifth week. The period of development, and the duration of this symptom, are subject to great irregularities; in one case, it may be, beginning with the first days of pregnancy, and continuing to the last, while in others it does not commence until an advanced period, when local irritation of the stomach is more likely to be the cause. We have seen cases in which, at first, morning sickness was as marked as usual, to this succeeded a period of immunity, extending over several months, the nausea returning with great discomfort to the patient during the last weeks, being probably due in the first instance to sympathy, and in the latter to the effect of proximity of the organs. Associated with the more familiar symptoms of morning sickness, are others which also have their origin in the digestive system, such as heartburn, pyrosis, epigastric pain, and troublesome eructations. Repugnance to various articles of diet, which possibly were relished before pregnancy, or a longing for unusual, and even deleterious or disgusting substances, such as occurs in chlorosis, are by no means unusual symptoms. Very rarely, indeed, do we meet in practice with cases in which some one or other of the above symptoms is not present, but there are cases in which, from first to last, no such symptom develops itself. Nor are the symptoms manifested during one pregnancy any sure criterion of their probable form in another, for we often find that a woman, who has suffered intensely in her first pregnancy from these digestive disorders, is on subsequent occasions remarkably free from them; nay, it may happen that women, who have never had morning sickness, complain of it for the first time on the occasion of a fifth or sixth pregnancy. All the affections alluded to constitute, when excessive, morbid conditions, and as such fall to be considered as disorders of pregnancy.

Salivation, although not a symptom of any practical importance, is occasionally so marked in degree as to constitute a prominent feature in the case. In this, there seems to be a special glandular sympathy, manifesting itself in a hypersecretion, which may last during the whole term of pregnancy. Under the same category of phenomena which have their origin in the glandular system, we may here notice certain changes in the urine which, since the time of the ancients, have attracted attention as symptomatic of the pregnant state. About thirty years ago, a number of observers directed their attention to the investigation of this subject, but the person whose name is most intimately associated with it is M. Nauche, by whom the name *Kiestein* was given to the substance referred to. From the numerous observations which have been made, by him and others, it would appear that the period of pregnancy at which this has been discovered varies considerably; that it is certainly not present in all cases of pregnancy; and that it has been discovered in certain morbid conditions which have no relation to the pregnant state. This, of course, reduces the value of Kiestein as a sign of pregnancy to a low level, but there can at the same time be no doubt whatever, that in a very large proportion of cases the substance may be discovered. When the urine is fresh from the bladder, there is no appearence whatever which would enable us to distinguish it from the ordinary excretion. About the third day, or sooner, it commences to lose its transparency, and becomes hazy as if mucus were suspended in it, and, shortly afterwards distinct traces may be seen, on the surface, of the formation of a pellicle, which is at first thin and transparent, but subsequently becomes much thicker and more opaque. About the third or fourth day, the distinctive characters of this pellicle usually reach their greatest intensity, and little flocculent portions then commence to detach themselves from its under surface, and sink though the liquid to the bottom of the vessel. The whole pellicle ultimately goes through this process, and becomes thus transformed into a whitish deposit which gravitates to the bottom, as did the flocculi first detached. The original pellicle is then replaced by another, which contains, as indeed may the first one, crystals of triple phosphate: the liquid becomes more turbid, until, finally, the appearances characteristic of pregnancy become lost in the process of putrefaction. Kiestein, then, first makes its appearance in the urine, under the form of a cloud, like cotton in suspension, which is due to the aggregation of little globules which exist in the urine when passed. These subsequently unite, rise to the surface, and constitute the pellicle which we have described. It is said that, when Kiestein is present in the urine, it persists from the end of the first month until delivery; but the observations of Cazeaux throw much doubt on this assertion, as regards the last six weeks, for he tells us that he examined in 1849 the urine of fifteen women at this stage of pregnancy, without discovering any trace of it. Chemical and microscopical researches seem to show that Kiestein is a new formation, and is an azotized substance, and that it presents itself under the form of minute globules. Whether the theory usually entertained in regard to it, that it is the result of an excretory function of the kidneys, peculiar to the circumstances of the case, is a question which we must in the meantime leave in doubt, but it must be admitted that there are several facts firmly established in physiology, which, from an analogical point of view, give some confirmation to the hypothesis.

Changes in the Mammæ.—The Mammæ are, from an early period, the seat of certain symptoms and changes, which are justly looked upon as of great importance. When we reflect on what their proposed function is, we cannot marvel that, even thus early, they become the seat of changes, which are evidently designed with the view of elaborating, and otherwise preparing, these important structures against the time when they will be called upon to discharge the function in question. The earliest indications which are given by the mammæ of the existence of pregnancy, are certain vague sensations, which are described by the woman as of fulness and weight, but which not unfrequently amount to considerable uneasiness, and even acute pain. This points to the awakened activity of the organs, further evidence of which is soon shown in a considerable increase of volume, due obviously to the greater afflux of blood, which dates from the earliest weeks, and which manifests itself at a more advanced period, by the presence of large blue veins, which may be seen coursing under the skin, more conspicuously in women of a blonde complexion. To the touch, the gland seems harder than usual, and here and there may often be felt clusters of enlarged milk vessels, which give the impression of knotting. Towards the end of pregnancy, or, if the distension is extreme, at a much earlier period, silvery white lines are seen upon the surface of the breast, radiating from the nipple as from a centre. These are due to the distension of the cutaneous structures, and the yielding of the subcutaneous cellular tissue at some points, so as to give facility to the expansion due to growth of the gland.

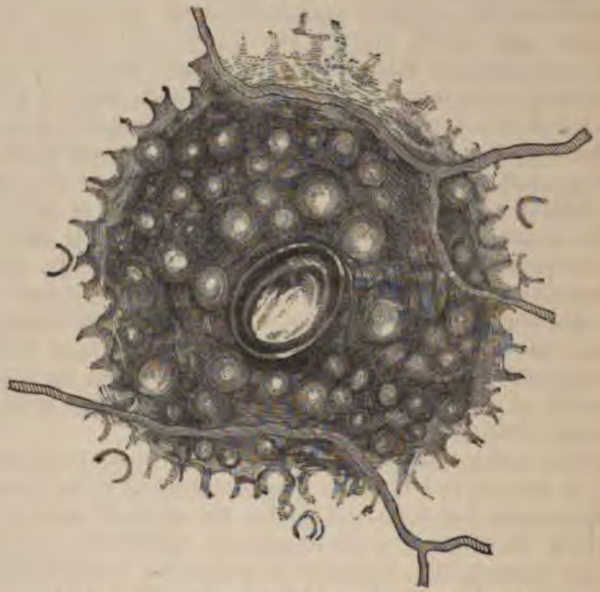
The secretion of milk in the breasts has very generally been supposed by the vulgar to be an infallible sign of pregnancy, either past or existing. Nothing can be more erroneous than such a conclusion: but, at the same time, the presence of milk in the ducts is, when taken along with other signs, often of very considerable importance. It is proper to mention, however, that not only is milk in the breasts no certain sign of pregnancy, but numerous cases are recorded by Montgomery and others, where the breasts of young women who had never been pregnant, and of old women past childbearing, have yielded milk in sufficient abundance to suckle a child. A striking case of this nature was narrated to the writer by Dr. Livingstone, the renowned African traveller, who had so investigated the circumstances as to eliminate even the possibility of doubt. A native woman was delivered of twins, and not being constitutionally very robust, was unable to nurse both, whereupon the grandmother, a woman of sixty, took one infant, when, after repeatedly placing it to the breast, the secretion was so abundantly established, that she proved an excellent nurse. Nay, more than this, there have been cases in which the gland in the male has secreted milk in considerable abundance.

Surrounding the nipple, and circumscribed by a circle of about three-fourths of an inch radius from its centre, the skin presents, in the adult and unimpregnated condition, a peculiar appearance, which consists chiefly in an increased depth of color. It is thin and delicate, and presents to the eye the semblance of a structure intermediate between skin and mucous membrane. From its surface, small glandular projections, varying in number from twelve to twenty, or more, may be seen to project slightly. This area, which is called the *Areola*, is the seat during pregnancy of changes which are frequently of the greatest importance in strengthening the presumptive proof which may already exist; but it must always be remembered that changes, closely resembling those which we are about to describe, may be produced by causes which have their seat in the generative system, but which are independent of pregnancy; and, moreover, that as the changes are to a considerable extent permanent, it is in first pregnancies that they have the greatest diagnostic value. The following are the appearances referred to: If the breast be carefully examined about the ninth week, a considerable increase in the size of the nipple will almost always be observed, this structure having become turgid, and, as it were, erect. Simultaneously with this, or closely succeeding it, there is a deepening in the color of the areola, an increase in its diameter, and a greater prominence and development of the follicles which stud its surface. It participates, obviously, in the increased vascularity of the nipple, and becomes, like it, moist and turgid. The alteration in color, which is due to this turgescence, takes place in all cases, but it is only in women of dark complexion that the characteristic changes of the areola are to their fullest extent manifested. In these, there is an actual deposit of pigment, and the depth of the color is, towards the termination of the pregnancy, not unfrequently such as to present a most striking and peculiar appearance. Examination of the follicles has shown that they are possessed of excretory ducts, through which their secretion may, under certain circumstances, be expressed.

At a period not earlier than the fifth month, there may generally be observed, in women in whom the areola is deep in color, some trace of what Montgomery has described under the name of *secondary areola*, and to which he attaches great diagnostic significance, amounting indeed, in his opinion, to a certainty of pregnancy independent of other signs. This secondary areola, which immediately surrounds the other, is, even when most distinct, very faint in color, and has been well compared to the effect produced by drops of water falling upon a tinted surface, and discharging the color. An attempt has been made in the accompanying cut (Fig. 83), to indicate the various appearances referred to.

The pigmentary deposit, on which the appearance of the areola of pregnancy in a great measure depends, is not in every case limited to the situation in question. In a large proportion of cases, a dark line, about a quarter of an inch in width, may be observed running along the middle line of the abdomen, from the symphysis to the umbilicus, and occasionally extending from thence as far as the ensiform cartilage. A dark-colored disk, occupying and surrounding the umbilicus, was occasionally observed by Montgomery, and is described by him under the name of the "umbilical areola;" and brownish streaks, analogous to the silvery lines in the breasts, are not uncommonly to be seen in the abdominal walls, running parallel to each other, and generally curved, with the convexity towards the groins. These streaks lose their color, but do not disappear after delivery, and are therefore of some importance in determining the question of previous pregnancy. As an occasional concomitant of pregnancy, there has also been observed a more general discoloration of the skin, so much so, indeed, as to give rise, in one case at least, to the suspicion of existing disease of the suprarenal capsules. In the case in question, the whole forehead, and part of the cheeks, neck, and breast, was deeply tinged of a yellowish-brown color, but within a few weeks after the birth of the child this had completely disappeared, nor was there at any time the slightest symptom, in addition to the discoloration, to encourage the belief in the existence of the disease of Addison.

FIG. 83.



Areola, and secondary areola of pregnancy (seventh month).

The appearance of the abdomen, although a very conspicuous sign of pregnancy, can only be admitted as such on the careful exclusion of certain sources of fallacy. For not only may solid tumors of various kinds give rise to appearances very similar, but fluid accumulations, such as ovarian cysts or dropsical effusions, or even distension of the bladder, may delude the unwary into a hurried and erroneous diagnosis. It behooves the observer, therefore, to be careful how he admits this point in evidence. Cessation of the menses, with abdominal enlargement, would almost certainly be admitted by an expectant mother and her friends as proof sufficient, but it sometimes falls to the duty of the medical attendant to dispel such illusions. Passing over, for the moment, the evidence to be derived in such cases by the practice of palpation, a certain amount of information may be obtained by the eye alone, in examining the abdomen in the various stages of pregnancy.

As we have already seen, the uterus, during the early weeks of pregnancy, instead of rising upwards into the abdominal cavity, actually falls downwards towards the floor of the true pelvis. This fact gives rise to the earliest modification in the outline of the abdomen, which consists, not in an enlargement as might have been expected, but in a dragging downwards of the umbilicus, and a flattening of the hypogastric region. This fact has been long recognized, and its expression is embodied in the old French proverb, quoted by all writers, "Ventre plat, enfant il y a." Actual abdominal enlargement dates from about the thirteenth or fourteenth week, but so much depends upon the figure of the woman, the number of children she has borne, the position of the child, and the quantity of liquor amnii, that the mere study of the abdominal outline would, in so far as uterine development is concerned, rarely afford us reliable information. The most important observation to be made consists in a careful examination of the umbilicus. During the first three months, the depression of the navel is somewhat deeper than usual. On the expiry of this period, it regains its original appearance. In the course of the fourth month, it becomes less hollow than before conception, and from this time the depth of the cavity becomes gradually diminished, until, about the seventh month, it becomes completely effaced, and is on a level with the surrounding skin. Nor do the changes of the umbilicus cease here, for during the two last months the umbilicus protrudes beyond the surface, being, as it were, inverted by the pressure which is brought to bear on the inner surface of the abdominal wall by the distending womb. This is a pretty constant sign, and is certainly the most important to be derived by an ocular observation of the abdominal wall; but similar phenomena may be caused by ascites and tumors.

In so far as external appearance is concerned, there is scarcely any variety of solid tumor connected with subjacent organs, nor even any tumor, due to fluid or gaseous distension, which may not, under certain circumstances, give rise to the suspicion of pregnancy. It is rarely, in practice, that the differential diagnosis of such affections presents any great difficulty; but there are cases in which difficulties undoubtedly exist, when recourse must be had to percussion and palpation, to remove such doubts as may arise. Such an examination enables us to determine the shape and limits of the tumor, and the relation which it bears to the bowels and other surrounding parts. Nothing is here of such importance as the consistency of the tumor. The extreme hardness of uterine fibroids, on the one hand, and the yielding softness of gaseous or fluid distension on the other, represent the extremes; between which endless varieties exist. But the uterus, when distended, communicates to the hand a feeling so peculiarly its own, as to enable any one possessed of the requisite *tactus eruditus* to pronounce on the subject almost with certainty. This feeling consists in a certain elasticity which, although it may be simulated, is different from that which is communicated by any other form of abdominal tumor. Besides this, the practice of palpation seems, in some cases, actually to cause a certain amount of feeble, painless contraction in the womb, which, when distinctly felt, is of the highest diagnostic value; but it must be remembered that these symptoms prove only that it is the uterus which we are touching, and are no evidence of pregnancy. If, however, we are convinced that the elastic tumor contains a solid movable body, there is scarcely any room for doubt. In cases where, from unusual thickness of the abdominal walls, or from some other cause, palpation gives obscure results, the history of the tumor, and, especially, the situation in which it was first observed, are points which may have special value. If ovarian, the tumor will have been observed, in the first instance, in either groin; if from the spleen or liver, the history will be of a growth developing from above downwards, instead of the globular uterine swelling, first observed in the middle line behind the symphysis, which steadily increases in an upward direction, and the nature of which is probably revealed by other important symptoms, some of which have already been detailed. In those cases, in which the tumor is proved to be the uterus—but the fact of pregnancy is still in doubt—there is always the possibility of the cavity being distended by other contents, such as intra-uterine polypi of various forms, distension of the cavity with gas (*physometra*), or a similar fluid distension (*hydrometra*). Actual difficulty, even in experienced hands, and error in diagnosis, are most likely to occur in those cases in which pregnancy coexists with some of the morbid affections above alluded to. We may have, for example, clear evidence of ovarian disease—a tumor, we shall suppose, partly cystic and partly solid, springing from either groin, and slowly increasing in size. In such an instance, on the occurrence of pregnancy, the abdominal tumor will increase with much greater rapidity; but, one cause of abdominal enlargement having already been established, the possibility of a coexisting cause may quite slip out of notice, and thus very serious mistakes have, in some cases, actually been made. When we come to consider the diseases and complications of pregnancy, we shall find that there are many other morbid conditions which, when associated with it, tend greatly to obscure the diagnosis.

Vaginal Examination.—Important information, either positive or negative, is afforded at all stages of pregnancy by a vaginal examination. In the early months, the descent of the uterus causes an apparent shortening of the vagina, and an increase in its width from side to side; but, from the end of the third month till towards the end of gestation,—when, as we shall see, the womb again falls downwards,—the extension of the vagina upwards results in an elongation and a consequent proportional narrowing of its diameters. There is clear evidence here also of increased activity of the circulation, corresponding to that which we have found to exist in the internal genital organs. It takes the form, in this situation, of a venous engorgement, which is due, in part at least, to obstruction, caused by pressure of the gravid womb, and is indicated by a more or less livid color of the mucous membrane—very different from the rose color of the unimpregnated state. This ocular examination of the parts, although it may thus reveal a sign which is far from being the least important, is, for obvious reasons, a method of research which cannot be generally adopted in the practice of midwifery, so that we have to depend here upon the results which are afforded by an examination which is conducted, under the bedclothes, by the finger.

Under the head of digital examination, the first symptom which often comes under our observation is one which is due to the increased vascularity of the parts to which reference has just been made, and consists in strong pulsations, which are obviously due to enlargement of the vaginal arteries. This, which is a sign of no great importance, has been described by Osiander under the name of *vaginal pulse*. During the later months, it is by no means unusual to find the mucous membrane hypertrophied and covered with small granulations or papillary projections, which are supposed to be the result of an abnormal development of the mucous follicles, and which are, certainly, often accompanied by an augmented mucous secretion. The chief, and in many cases the sole object of vaginal examination is to ascertain the condition and anatomical relations of the inferior segment of the uterus; and, more especially, the state of the os, and of that portion of the cervix which projects into the vagina. In those early weeks, during which the uterus descends within the cavity of the true pelvis, the descent is said to be accompanied by a certain amount of anteversion, which enables the experienced accoucheur, as early as the sixth week, to recognize in the anterior vaginal cul-de-sac a fulness or slight resistance, which is absent in the normal and unimpregnated condition of the parts. As pregnancy advances, this becomes more distinct, although higher, until the most depending part of the fœtus can be distinctly recognized through the anterior uterine wall.

CHAPTER IX.

SIGNS OF PREGNANCY (CONTINUED).

CHANGES IN THE OS AND CERVIX UTERI: PROGRESSIVE SOFTENING OF: CHARACTERS OF AT VARIOUS STAGES: (A) IN PRIMIPARÆ, (B) IN PLURIPARÆ—POSITION OF OS IN RELATION TO PELVIC WALLS—PRACTICE OF THE "TOUCHER"—EXAMINATION PER ANUM—QUICKENING: FŒTAL MOVEMENTS OBSERVED: (A) BY THE MOTHER, (B) BY THE ACCOUCHEUR—BALLOTTEMENT OR REPERCUSSION—FŒTAL PULSATION—FUNIC SOUFFLE—UTERINE SOUFFLE: THEORIES AS TO ITS PRODUCTION—STETHOSCOPIC EXAMINATION OF FŒTAL MOVEMENTS—SIGNS DIVIDED INTO CERTAIN AND PROBABLE—TABULAR RÉSUMÉ OF THE SIGNS OF PREGNANCY.

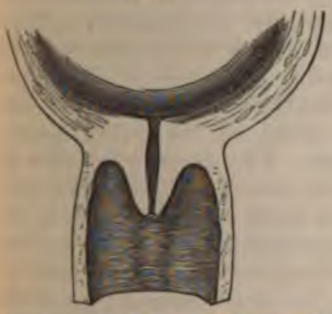
IT is from the observation of the Os and Cervix Uteri that the most important information is derived in the course of a vaginal examination; for not only does this give us indications of pregnancy at a very early stage, but it enables us in many instances to judge, proximately at least, of the stage which the pregnancy has attained. From a very early period of gestation, a difference takes place in the firmness and resistance of the cervical tissue, which is due, in the first instance, to the congestion and hypertrophy of which this, as well as the other portions of the uterus, are, immediately after conception, the seat. But, in addition to this, there is a special change, which a few careful examinations by the finger will enable any one to recognize, and which is admirably described by Cazeaux. "Towards the end of the first month," he says, "one may already discover that, in addition to the first general modification, that portion of the lips of the os which is situated most inferiorly, or rather most superficially, begins to soften. This appears to be rather an œdematous condition of the mucous membrane, than an actual softening of the tissue proper of the lips, so that, in pressing slightly upon the thick and softened membrane, the finger at once perceives its fungous softness, but seems immediately afterwards to reach the tissue proper of the neck, which still retains its normal consistence. The sensation thus conveyed closely resembles that which we obtain if we press with the finger upon a table which is covered with a thick and soft cloth. It is not till towards the termination of the third month, or the beginning of the fourth, that the entire thickness of the lips of the os is softened, to the extent of two or three millimetres. From the fifth month, the softening extends from below upwards, and, at the sixth, reaches the centre of the vaginal portion of the cervix. During the three last months, it invades, step by step, the superior part, until it reaches the internal os, so that at the end of pregnancy, the neck is so soft, in the case of certain women, that I have often observed that students had great difficulty in distinguishing it from the walls of the vagina." This, according to the distinguished accoucheur, from whom we have quoted, should be looked upon as a very important sign of pregnancy, and is very constant in its occurrence, unless it be in cases where the tissue of the cervix is the seat of pathological alterations.

The shape of the os and cervix also undergoes, during the advance of pregnancy, some very remarkable changes. The os very early loses the form of a transverse slit, and becomes more circular in form, while the comparative softness of the tissue admits sometimes of the introduction of the point of the finger. This becomes much easier as pregnancy advances; and the softening process described by Cazeaux extends, so that, by the sixth month, it is occasionally possible, even in primiparæ, to introduce the point of the finger. A reference to the diagram already shown (page 145) indicates the manner in which, when the cavity proper has been distended up to a certain point, that of the cervix becomes invaded in the march of development. Although the stealthy invasion of the os by the softening process causes the cervix to seem shorter at a much earlier period, as, indeed, it is described by many writers, it is not till after the twenty-fourth week that the os internum yields; and the cavity of the cervix being then encroached upon, the shortening of the cervix, or rather its obliteration from above downwards, becomes more and more apparent, until, at the termination of pregnancy, no trace whatever of it can be discovered, and the finger, when introduced, comes into immediate contact with the membranes. In the following diagrams is indicated the condition of the os at various stages of pregnancy.

There is every likelihood that the description here given, which differs little from that of almost all English writers, is pretty nearly accurate as regard first pregnancies; and in the diagrams (Figs. 84, 85, 86), it may be observed that the general appearances are those which may be supposed to indicate the result of a first impregnation, as is shown, more especially, by the smoothness of the lips of the os.

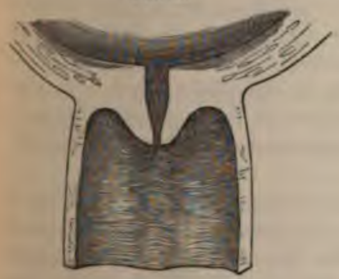
An error of some magnitude is, however, committed by those who seem to imply that this description will suffice for pluriparæ as well as primiparæ. This is an erroneous impression, which a very little practical investigation will serve to dissipate. The characteristics which enable us to recognize a pluriparous os have already been fully de-

FIG. 84.



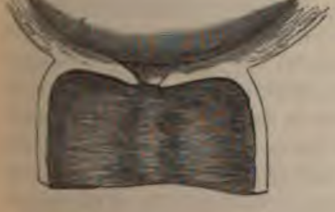
Cervix uteri about the twenty-fourth week after impregnation.

FIG. 85.



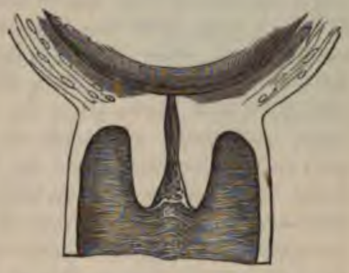
Cervix uteri in the thirtieth week.

FIG. 86.



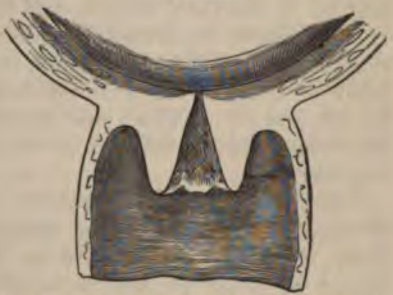
Cervix uteri at the end of pregnancy.

FIG. 87.



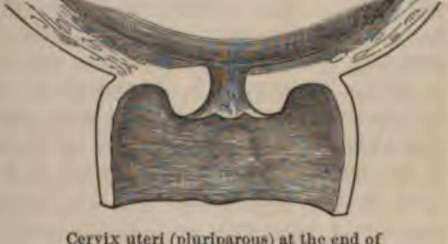
Cervix uteri (pluriparous) at the twenty-fourth week.

FIG. 88.



Cervix uteri (pluriparous) at the thirtieth week.

FIG. 89.



Cervix uteri (pluriparous) at the end of pregnancy.

tailed, and consist mainly of fissures and irregularities in the lips of the os, which deprive the orifice of its symmetry and smoothness. When, under these circumstances, the uterus develops in the course of pregnancy, the conditions vary, and necessarily vary very considerably. The softening process attacks the tissue of the cervix in a manner precisely similar to that which obtains in the case of primiparæ. There is in this case, however, a gaping external orifice, which admits easily, even earlier than the twenty-fourth week, the point of the finger. From this period onwards, till about the thirty-sixth week, the only change which takes place is, that the cavity of the cervix becomes more and more accessible to the finger. The mechanical effect of previous pregnancy seems to be that the cavity proper admits of a more ample distension, so that no call is made upon the cavity of the cervix until the termination of pregnancy approaches. Even in those instances in which the cavity of the cervix is most easily permeable by the examining finger, the os internum is, in pluriparæ, often found quite impassable at the thirty-sixth or thirty-seventh week. From this period, however, a very rapid shortening of the cervix takes place during the last few weeks, until, at the fortieth week, as in primiparæ, the cervix is in a manner effaced. But there remains to the last, instead of the thin, smooth, and almost membranous margin of the os in primiparæ, an irregular œdematous lip, which is in the highest degree characteristic, and which is not wholly lost even during the first stage of labor. There is represented in the diagrams on p. 159 (Figs. 87, 88, and 89),—which may be compared with the adjoining figures,—the distinguishing features of the pluriparous os, as observed from the vagina.

The description, then, which is usually given of the state of the os during the various stages of pregnancy is applicable only to the case of those within whom a fœtus is, for the first time, being developed. Rapid as is the process by which the uterus is reduced in size after delivery, it never completely regains its virgin state. The os and cervix are the parts which show most distinctly the peculiarities which attach to those who have already borne children; and, in the course of a digital examination, this peculiar feature comes prominently under our notice. This method of examination, therefore, enables us not only to recognize the stage of the pregnancy, but also to distinguish between first and subsequent pregnancies, due regard being had to the manner in which the cervix is developed in the two classes of cases. Stoltz asserts that the description usually given is, in all respects, inaccurate; and that in primiparæ, as well as multiparæ, the cavity of the cervix is not encroached upon till within a fortnight of the time of delivery. The facts to which attention was originally directed by Désormeaux, and which have been abundantly confirmed by subsequent observations, are not admitted by Stoltz and Cazeaux as proof, even in first cases, of encroachment from above upon the cavity of the cervix; but are said to be due to an approximation of the os internum and os externum, and a fusiform expansion of the intervening cavity—due to the softening process already so often alluded to. We believe, however, that the original description is in the main correct as regards primiparæ, although

Désormeaux and his followers go too far when they assume that the shortening of the cervix commences so early as the fifth month.

The position of the os uteri, relatively to the walls of the pelvis, is another point which is disclosed in the course of a vaginal examination. This is, however, of more importance in conveying information as to the stage of pregnancy than in regard to the fact of its existence; but as it may, under certain circumstances, become an important point in evidence, its omission here would be improper. We have already seen that, in consequence of the growth downwards of the uterus, the os is, in the first instance, displaced in the same direction, and, as we believe, somewhat forwards. This is a point, however, in regard to which writers are not agreed, and a description, which is quite the opposite of this, is given by some of the most distinguished English writers, who maintain that the os, during the first weeks, is displaced downwards and backwards. The escape of the uterus from the true pelvis, and the subsequent and rapid upward development of its body, soon causes a corresponding movement upwards of the os, which thus seems to follow the fundus, in proportion to its development, steadily upwards in the pelvis from the tenth to the thirty-seventh week, when it attains the highest point, and is reached by the finger sometimes with a little difficulty. With the descent of the uterus in the last weeks, it again sinks downwards, and, at the same time, moves backwards; so that, though lower, it is not more within reach of the finger. This final movement corresponds to the falling downwards and forwards of the fundus, to which reference has already been made. Sometimes the head descends to an unusual degree in the pelvis, and, in such cases, may push before it the anterior segment of the uterus. From this cause a difficulty occasionally arises, which may even give rise to the suspicion of congenital absence of the os; but a careful examination by the finger, in the direction of the hollow of the sacrum, will rarely fail to disclose the position of the os—the difficulty being, of course, greater in first than in subsequent pregnancies, owing to the membranous thinness which the lips of the womb frequently, in these cases, assume.

In the practice of the *toucher*, or digital examination of the vagina, skill and experience are of paramount importance; and as it is by practice alone that the required dexterity can be attained, it behooves the student to avail himself of every opportunity which may arise for adding to his store of experience. With this view some uniform scheme or method of examination should be adopted. A long finger is doubtless an advantage, but the advantage is by some writers greatly exaggerated. The index finger may alone be used, but some prefer to use two, by which we no doubt gain something by the greater length of the second finger. This advantage, however, is frequently counterbalanced by the increased pain which the examination gives the woman, causing her to shrink and draw away from the hand of the accoucheur. The finger should be passed forward from the situation of the coccyx over the anus and the posterior commissure of the vagina. It may seem almost too ridiculous to suppose that the anus should in such an examination be mistaken for the vagina, but the knowledge of the fact that the mistake has been committed will suffice to prevent the student from a similar error. The finger should be well oiled or smeared with lard, with the object in all cases of facilitating introduction, and in a certain class of cases to protect the finger. Notice is to be taken, as a matter of routine, of the state of the perineum, labia, and other parts. The condition of the vagina and rectum, and of the pelvic walls, must, in like manner, not be overlooked, for, in all questions bearing upon pregnancy, the state of these parts must have a special interest, and the timely recognition of anything abnormal may have the result of averting a calamitous result. In the actual examination of the os and cervix, some assistance will occasionally be derived from the use of the hand over the surface of the abdomen, by which the fundus may be steadied and the os pressed downwards more within the reach of the finger. In conducting such investigations as we have been referring to, the strictest caution must, in every instance, be exercised in order to obviate the possibility, which exists in every case, of premature labor being induced by rude and careless hands. The amount of irritation necessary to excite the uterus to contraction varies greatly in different cases, but we cannot doubt that incautious interference, more especially with the os and cervix, may incite contraction, and cause the loss of the product of conception.

In the investigation of uterine diseases unconnected with pregnancy, it is often proper to institute an examination *per anum*. In the practice of midwifery, and the diagnosis of pregnancy, such a mode of examination is very seldom necessary. Cases, however, do now and again occur, in which, owing, it may be, to excessive tenderness of the parts, or to partial obliteration of the vagina, the result of sloughing, we may be obliged to have recourse to this expedient. Or, again, it may be necessary for the proper examination of tumors, which exist as complications of pregnancy, and which are connected with the posterior part of the pelvis. And, in one other group of cases, we are recommended by Montgomery to examine thus, "when, for any particular reason, it is thought desirable to ascertain whether the uterus is enlarged within the first two months of supposed pregnancy." Under any circumstances, however, this mode of examination is so repulsive to the woman that, with that consideration for her feelings which should always sway us, we instinctively shrink from proposing it, unless the circumstances be such as to render it absolutely essential.

Quickening.—The period of Quickening is that at which the mother becomes for the first time conscious of the movements of the fœtus within her womb. They who at one time believed that the ascent of the uterus from the pelvis to the abdominal cavity took place suddenly, and was not a simple process of gradual dilatation, held, naturally enough, the view that the quickening was this assumed sudden motion. Every woman now knows that it is due to the actual movements of the living child, which are at this period first communicated to her senses. The sensation, however, does not represent the first movements of the child, for they are seldom perceived by the mother earlier than the sixteenth week, whereas, in abortions at a much earlier period, vigorous movements have been observed after the expulsion of the embryo. Nor is it an uncommon thing, in the course of an abdominal examination by the hands and the stethoscope, to feel or to hear slight movements which we can only suppose to be exercised by the fœtus, and that too at a time when the mother may still be in doubt as to the fact of her pregnancy.[1] The time usually stated as that of quickening is about the middle of pregnancy, or four and a half calendar months. This belief, although only a popular one, is sufficiently wide of the truth to call for correction. It is difficult, however, to fix upon a period as a safe average, as we know that the time of quickening may vary from the end of the second to the eighth month. In a very large majority of cases, about the seventeenth week may be assumed as the period at which women feel the first feeble flutterings which to them indicate the vitality of their offspring. In some instances, the movement is more decided, even at this time, but the rule is that it is at first very faint, and gradually becomes stronger in proportion as the development of the fœtus progresses. In the later months, the fœtal movements become so vigorous, that they may cause the woman actual pain, and have been known to cause her to cry out; and, at this stage of pregnancy, the movements which are perceived are due to brisk flexion and extension of the joints of the lower limbs, the sensation being in some instances due to smart kicks, and in others to a continuous movement, such as might be caused by the passage of the knee along the inner uterine wall. Important as this sign is to the accoucheur, and all-important as it is to the woman, it is nevertheless one in regard to which we must always be cautious, as there are fallacies which may lead astray even those women who have previously borne children, and who may thus be supposed to be familiar with the sensation in question. The conditions which may give rise to such erroneous impressions are rapid movements of gas in the intestines, irregular contraction of the muscles of the bowels, or even of the muscles which form part of the abdominal walls, and the pulsatile movements of an aneurism, or of a large artery, which, being communicated to a tumor within the abdomen, may very readily deceive a woman who already suspects that she is pregnant. Such cases are so frequent, that we must always be careful in receiving in evidence the mere statement of the woman.

We have hitherto spoken only of the active movements of the fœtus, as observed by the mother. But these movements receive, as evidence of pregnancy, a vastly increased significance, if, in addition, the accoucheur is able to convince himself of their reality, which he generally can succeed in doing by careful abdominal palpation. The nature of the tumor, its symmetry, and its elasticity, will already have prepared him for the corroborative evidence which he expects, and a very ordinary skill will prevent him from being misled by any disturbing influences, such as may deceive the woman. He is conscious of the presence under his hand of a solid body, contained within an elastic tumor. He presses this body from side to side, and in various other directions, with the almost certain effect, if the child be alive, of causing such movements as, from the fifth month onwards, will place the question of pregnancy beyond the possibility of doubt. His eye, meanwhile, may follow many of the more violent of these movements, the abdominal wall forming from time to time distinct projections, corresponding to the subjacent portion of the limb or body of the fœtus, so that the outline of the abdomen is for the moment distorted, the projecting part often suddenly changing its site before it sinks down again within the liquor amnii. But even here we are not safe from error, as, in some instances, movements closely resembling those of pregnancy have been observed by the accoucheur. The only condition, however, which might mislead any one using ordinary care, is that which arises from spasmodic action of the abdominal muscles.

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[1] It is now generally believed that the mother cannot be conscious of the fœtal movements until the uterus comes in contact with the abdominal walls. It is then for the first time possible that the sensation can be transmitted by sensory fibres of the cerebro-spinal system ramifying in the abdominal parietes. This theory accounts, as it appears to us, quite satisfactorily, for the phenomena which exist; for we cannot doubt that the limbs of the child must strike the uterine walls at an earlier period than they are perceived by the mother, and it is not to be expected that the sensation could be communicated through the few filaments which reach the uterus from the cerebro-spinal system, as these are confined to the os and cervix.

An interesting example of this occurred several years ago in the Glasgow Royal Infirmary, in one of the wards at that time under the care of the writer. This woman was thirty-two years of age. She had been married for several years, but had had no children. She had been admitted on account of bronchitis, and was highly hysterical. She stated that she was pregnant, an assertion which at first attracted little attention, but as she stated subsequently that she had been pregnant for fourteen months, the case was looked upon with some interest by the gentlemen attending the clinic. The symptom upon which she founded her belief was the motion of the child, which she said she felt frequently and quite strongly. On examination, a tumor was observed in the abdomen, somewhat to the left of the middle line, reaching as high as the umbilicus, and not at all unlike the gravid uterus at the sixth month. When the hand was placed over this and held steadily for a little, distinct jerking movements were noticed, which, for the moment, seemed to have some resemblance to such as might be caused by a fœtus in utero. A little further examination soon showed the true nature of the case; the tumor was tympanitic on percussion, and nothing like the outline of the uterus could be felt; the os, on vaginal examination, was found to have none of the characteristics of pregnancy; the stethoscope gave a negative result. And to make things certain, the woman was put under the influence of chloroform, when the tumor completely disappeared, and the suspicious movements ceased. The case was one of "phantom tumor," with spasmodic contraction of the abdominal muscles; but no amount of reasoning could shake the patient's belief in her pregnancy, and she left the hospital in the full belief that she was sixteen months gone with child, and that in the course of the succeeding month she would give birth to a child in an unprecedented condition as to development.

Ballottement.—An important sign of pregnancy is also to be found, under certain special conditions, in the passive movements which may be imparted to the fœtus. This sign has been called by some English writers "Repercussion," but is more familiarly known under the

French designation "Ballottement," which is, certainly, the more appropriate of the two. The following is the manner in which this test is usually applied: The woman is placed in a position which is intermediate between reclining and standing, and a very convenient plan is to have her shoulders supported behind, while she sits on the edge of the bed, with her feet upon the ground. The fundus uteri is then steadied by one hand, while the index finger of the other is introduced in the usual way into the vagina, with the palmar surface upwards. The finger thus placed is then brought into contact with the anterior segment of the uterus, near the cervix, where the presenting head of the child will generally be most easily felt. A smart jerk is given upwards, and the finger then kept perfectly steady, in its original situation, when, if the attempt be successful, it will be found that the fœtus, which had risen up in the liquor amnii, in obedience to the impetus which had been given to it, falls, in a few seconds, back into its original place, and again gently poises itself upon the tip of the finger, communicating to it the peculiar sensation from which the test derives its name.

Although the posture above indicated is that in which the sign of ballottement is most readily recognized, it is by no means the only position in which it may be made out. A precisely similar sensation, indeed, is communicated when the woman lies upon her back, or even (although more rarely) when she occupies the ordinary obstetrical position on the left side. The same effect may also be produced in the course of abdominal palpation, about the fifth or sixth month, when, if the woman is placed upon her side, in the horizontal position, and one hand passed beneath the projection, there will be felt, if the abdominal walls are not too thick, some portion of the body of the fœtus resting upon the hand. This, not unfrequently, may be displaced, and will return upon the fingers precisely in the same manner, and on the same principle, as when the examination is conducted in the usual way.

The sign of ballottement establishes the presence, in a fluid medium, of a solid body. This body must obviously be, on the one hand, of sufficient size to be perceptible to the sense of touch, and on the other, of a size considerably less than the cavity which contains it. It is clear that, unless these conditions are fulfilled, the sign is not available for the purposes of diagnosis. Of this proposition it is an obvious corollary, that it is only during a certain period of a pregnancy that ballottement can be distinguished. Before the fourth month, the size of the embryo is so small that it is impossible to produce the movement; but from this epoch till about the seventh month, it becomes more and more distinct. For a few weeks after this it may still be observed, although with greater difficulty; but, during the last six weeks, this method of examination gives no result whatever, in consequence of the great size of the child, and the extent to which the uterine cavity is filled by it. For a similar reason, it is not available in twin pregnancy. The only exceptions to this rule are cases in which the quantity of liquor amnii is greater than usual. Ballottement, in the hands of an experienced practitioner, may be looked upon as a certain proof of pregnancy; but by the inexperienced it is never to be relied upon, without strong corroborative evidence of some kind. The conditions requisite for its production are all fulfilled, it must be remembered, in the case of calculus in the bladder, when the solid body may be displaced with ease in its fluid medium. Anteversion of the womb, too, has, on a hurried examination, given rise to sensations closely resembling those of ballottement. In admitting, therefore, that ballottement is a certain sign of pregnancy, we do so, we repeat, with the reservation that it is so in experienced hands alone.

Fœtal Pulsation.—By far the most important of all the signs of pregnancy, is that which is associated with the name of Mayor, of Geneva, who was the first to discover that the heart of the fœtus could be heard beating through the abdominal and uterine walls. This discovery was announced in 1818, but attracted little notice until several years later. The period at which these sounds become audible in the course of pregnancy, is subject to considerable variation. It is certain that, as a general rule, it is not till the fifth month that they can be detected; but many trustworthy observers have asserted that they have heard them in the course of the fourth month, and even as early, in some few cases, as the eleventh week. This latter statement is generally looked upon with incredulity; but there can be no doubt but that occasionally the sounds may be heard in the fourth, third, or second, or even in the first week of the fourth month. On an average of a large number of cases, the eighteenth week may be stated as about the period at which we may expect to hear it.

These pulsations are much more frequent than those of the mother, and are, like them, distinctly double. They, of course, lack the volume of the maternal sounds, and are further enfeebled by the distance from the ear, and by the low density of the intervening media. The frequency of the beats is increased by the fœtal movements, and may thus be found to vary at different times; but it generally ranges from 130 to 160 in a minute. Some interesting observations made by Steinbach and Frankenhäuser seem to show that the heart's action is more rapid in females in the proportion, as they say, of 144 to 131. The pulse of the mother has no marked influence upon that of the child. It is scarcely possible, therefore, for any one who takes note of this frequency in the beats, to mistake them for maternal pulsations, which might, of course, under various anatomical and pathological conditions, be produced in any tumor under examination. The only case in which the possibility of difficulty can be admitted is where the maternal pulse is unduly accelerated by the existence of fever, or by some more transient cause; so that, in practice, it is well to adopt the simple precaution of placing the finger upon the mother's wrist at the moment we are making the stethoscopic examination, when, if there is obvious dichronism, we are sure of our diagnosis, while, on the contrary, if there is even an approach to synchronism in the two pulses, caution on our part is clearly indicated.

The pulsation of the fœtal heart is never heard over the whole surface of the abdomen, but, on the contrary, over an area which is always limited. This site varies with the position of the child, and it is often only after prolonged exploration that a point is discovered where the sounds are clearly audible; and, as we have already shown that the position of the child is more constant the nearer it is to the end of pregnancy, it follows that the earlier the period at which the examination is conducted, the greater will be the variety in the site at which auscultation has a successful result. It is usual, with the view of saving time and trouble, to adopt a uniform plan in conducting this investigation, beginning always at the point at which the sound, for well-known reasons, is most frequently to be distinguished. The child, as is known, lies in the womb, in a very large majority of cases, with the head downwards, and the back forwards and to the left, some portion of the back part of the trunk being thus brought into contact, almost invariably, with the uterine wall, somewhat to the *left* of the middle line. If we place the stethoscope over any portion of the uterus other than this, the layer of amnionic fluid which lies between our ear and the heart of the fœtus cuts off all acoustic communication; whereas, at the point just named, there is continuity of solid tissue, and through that the sound is conducted. The extent of the area over which the sounds are heard depends, in a great measure, on the quantity of the liquor amnii, being greatest when it is scanty, while, with much liquid, a small portion only of the fœtal trunk comes into contact with the uterine wall, and the area is thus proportionally small. The point, therefore, at which we have the best chance of at once catching the sound, is about midway between the umbilicus and the symphysis pubis, and somewhat to the left side. If the child is in what will be described afterwards as the second cranial position, the back being thus forwards and to the right, we may expect to hear the sound at a corresponding point to the *right* of the middle line. In dorso-posterior positions, whether of the head or of the breech, the convexity of the spinal column being turned backwards sometimes constitutes a difficulty in auscultation, as is also created by an unusual quantity of the liquor amnii (Dropsy of the amnion), and by various abnormal positions of the child. If, however, an examination conducted with due care at any time after the fifth month, and in the course of which the whole of the abdominal surface has been carefully explored, fails to detect the fœtal pulse, this, of itself, is very strong evidence either that pregnancy does not exist, or, if it has existed, that the fœtus is dead.

It is generally believed to be possible to determine, by means of stethoscopic examination, the existence of a twin pregnancy by the following peculiarities: that, in twin pregnancies, the two hearts are heard beating at opposite points of the abdomen, and that they are frequently not synchronous in their action. If the latter point can be conclusively established by the simultaneous examination of two observers, the case is clear; but, in regard to the mere existence of pulsation at two opposite points of the abdomen, this cannot be admitted as satisfactory proof. It has, by some, been asserted that the distinction is easy, and that, when we have pulsation at two points, in a single pregnancy, the sounds reach their greatest intensity midway between the two; whereas, in a twin pregnancy, examination in the intermediate area gives a negative result. This, if true, would be a sure and easy test; but we are perfectly certain it is not to be relied upon, although it may represent the general rule. Still, taken along with the shape of the abdomen, pulsation at two points is an important symptom in the diagnosis of twins, which are generally placed to the right and left in the womb.

Funic Souffle.—Dr. E. Kennedy has described another stethoscopic sound, which is synchronous with the fœtal heart. "In some cases," says he, "where the uterus and the parietes of the abdomen were extremely thin, I have been able to distinguish the funis to the touch externally, and felt it rolling distinctly under my finger, and then, on applying the stethoscope, its pulsations have been discoverable, remarkably strong; and on making pressure with the finger for a moment on that part of the funis which passed towards the umbilicus of the child, I have been able to render the pulsations less and less distinct, and even, on making the pressure sufficiently strong, to stop it altogether." This assertion of Dr. Kennedy's has been vigorously controverted in Germany; but, even admitting the description to be absolutely correct, the observation is one, as has been well observed by Dr. Tyler Smith, "which can hardly be of practical use, because, when the abdominal and uterine walls are so thin as to permit us to feel the pulsation of the funis through them, the other auscultatory signs of pregnancy, and the evidence obtained by palpation, must already have set the question at rest; and, except under such circumstances, it must be very difficult to discover the funicular soufflet."

Uterine Souffle.—The "bruit de souffle," "placental souffle," and Uterine Souffle, are among the most familiar of the designations which have been applied to another and an important auscultatory sign, which was originally discovered, in 1823, by M. De Kergaradec, but for whom, also, the more important observation of M. Mayor would have been overlooked. The various names by which the souffle is described point pretty clearly to the well-known fact, that speculations as to its nature and its cause have given rise to various theories, which display the existence of very contradictory opinions. All agree that the sound is maternal, not fœtal, as its rhythm corresponds to that of the maternal heart. The universal acceptation of the term "souffle" shows that, in regard to the nature of the sound, observers are at one. But, in so far as its seat and mode of production are concerned, great divergence of opinion has existed.

The Uterine Souffle, as, for reasons to be stated presently, and following Dubois, we prefer to call it, is distinguishable at an earlier period than the fœtal pulsation. Dr. Kennedy, who has given much attention to this, as to the other signs of pregnancy, maintains that he has heard it as early as the tenth week; but, usually, it is not till the sixteenth week, or even later,—or, in other words, until the uterus is accessible to the stethoscope,—that it can be made out. These remarks apply to examination through the abdominal walls, for if the metroscope of M. Nauche be used, it is possible that it may be heard at a somewhat earlier period. An occasional characteristic of the sound is that it is not constant. It may be distinctly audible at one moment, and may disappear the next, to return again in a short time,—these changes taking place without any appreciable cause. In some cases, it is heard over the whole abdomen ; while, in others, it is confined within a limited boundary, usually in the region of the groins. Generally it is heard, in advanced pregnancy, over the whole of the lower part of the uterus, but not over the fundus, nor in the lumbar region ; but, in the earlier months, it may be heard over the symphysis, or wherever the uterus is accessible to the stethoscope. In regard to tone and pitch, the varieties are endless,—presenting, in fact, from the soft whiff to the musical cooing or rasping sound, all the peculiarities of aneurismal or cardiac murmurs; and, what is not a little remarkable, it varies, in this respect, not only in different individuals, but in the same individual at different times.

If the observation be made during a labor pain, a very striking effect is often found to be produced by the contraction of the uterine fibres, the sound becoming, in the first instance, louder, more sibilant, or even musical, and then, at the height of the pain, becoming lost—to return, as it passes off, in the inverted order of the tones, as the pressure on the vessels is relaxed. It seems to have no fixed relation to the site of the placenta, and it certainly gives no reliable evidence, as might, perhaps, have been expected, as to where the placenta is situated in the uterus. The uterine souffle as a sign of pregnancy, is, no doubt, extremely valuable, and is to be distinguished from any other arterial sound by the absence of impulse, and its persistence in every posture; but it must, on no account, be admitted as a certain sign. For, the attention which has of late years been given to the diagnosis of ovarian tumors has shown that one of the most constant signs of a pathological uterine tumor, and which goes far to distinguish it from a similar structure which has sprung from the ovary, is the existence of a souffle, which has the closest possible resemblance to the souffle of the pregnant womb.[1] Under no circumstances is the uterine souffle to be held as proof of the life of the child.

A certain number of observers were long of opinion that the sound which we are now considering was caused by pressure on the great arterial trunks which lie in the posterior part of the pelvis. This must at once be admitted as a possible cause of such a sound, seeing that pressure on vessels in any situation may produce a souffle. But that this is not the case in pregnancy, seems to be proved by the fact, that such a change of posture (the prone position, for example), as would remove the uterus for the time being from the neighborhood of the vessels, never has the slightest effect in arresting the souffle. The view which was entertained by M. Kergaradec himself, in regard to the production of the sound, was that it was produced in the utero-placental vessels, and on this account he named it the "bruit placentaire." That it is not so, is now universally admitted, and the idea was, indeed, completely refuted by the discovery that the sound is heard at so many various sites, and still more conclusively by the observations which have been made after delivery, and which have proved that not only may the sound be heard after the birth of the child, but even after the placenta has been expelled.

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[1] **Many believe this to be due merely to pressure on neighboring large vessels. Sometimes it is so ; but, we are persuaded that the cause of the sound is generally in the uterine walls.**

The theory which owes its origin to Dubois is as follows. This distinguished accoucheur assumed that the blood, in passing from the uterine arteries to the uterine veins or sinuses, presented characters precisely analogous to those which constitute aneurismal varix, or which produce the souffle in erectile tissues. In all of these cases, as he observes, we have arterial branches discharging their blood directly into veins, the more rapid current joining a more sluggish one; and this, he adds, "is undoubtedly the cause of the murmur and the bruit de souffle which is so remarkable in aneurismal varix and erectile tissues." His conclusion is that, very probably, the same causes within the uterine walls produce the same results. A theory somewhat similar to that of Dubois has been advanced by Corrigan, with the additional suggestion that the sounds are modified by pressure of the fœtus against the uterine walls. De la Harpe believed that the sound was due simply to the multiplicity of currents of blood within the uterine walls: the sound from each vessel being, by itself, inaudible, but the aggregation of many giving rise to the familiar sound. Finally, there is the view of Scanzoni, who holds that the blood during pregnancy is in a chlorotic state, and that the sound is due mainly to causes which have their seat in the composition of the blood, and are accompanied by murmurs analogous to those with which we are familiar in the case of chlorotic women. The ingenious theory of Dubois may, no doubt, in some particulars, be inaccurate; but the opinion now generally entertained of the cause of the bruit is—that it has its origin in the uterine walls, and neither in the vessels external to them, nor in the placenta within them, and that, therefore, the views of Dubois and Corrigan are, in all probability, very near the truth.

As has already been observed, the movements of the fœtus may occasionally be observed, by means of the stethoscope, at a very early period. This mode of investigation, which we owe to the younger Naegele, is one which is surrounded by so many difficulties and sources of fallacy that, important as it seems to be, it is never likely to be of any great practical worth. The possibility, however, which is undoubted, of thus recognizing fœtal movements at a time when the other evidence must be very inconclusive, is a point not to be lost sight of. Possibly this, as well as the other stethoscopic sounds, might be early recognized by the use of the Metroscope, a modification of the stethoscope, which was devised by Nauche with the view of directly auscultating the uterus from the vagina, but which has fallen into disuse. One other stethoscopic sound has been described by Stolz, which, although it has little to do with the diagnosis of pregnancy, may be mentioned here. It consists in a sort of murmuring or rustling sound, and is due, according to him, to the decomposition of the amnionic fluid, and is thus to be held as symptomatic of the death of the child.

The Signs of Pregnancy consist, then, of a few which are Certain, and of a considerable number which are Probable or Presumptive. The certain signs are:

1. The Sounds produced by the Pulsations of the Fœtal Heart.
2. The Active Movements of the child, distinctly felt *by a skilled person.*
3. The Passive Movements, in which consists the sign of Ballottement.

If any one of these signs is made out, the woman is incontestably pregnant. But, in regard to the negative evidence which is afforded by their absence, this can only be admitted as proof that the woman is not pregnant when the other signs are awanting: the absence of one is only sufficient to warrant a doubt. To the three certain signs given above, we might, perhaps, add a fourth—the secondary areola of Montgomery; but, as this is open to doubt, and is only to be observed in a limited number of cases, we include it among the probable signs.

It is quite unnecessary that the latter should be again enumerated. Singly they are of no value; but, when a considerable number of them are simultaneously observed, in cases where pregnancy is expected, as in married women, the evidence thus afforded is tacitly admitted as complete. For such a diagnosis the medical attendant should not be held responsible; but, if it turns out, after all, to be a mistake, he will find that, in accounting for the blunder, a large share of the blame will lie at his door. For a certain opinion, such as one would be warranted in giving upon oath in a court of justice, no combination of merely probable signs will suffice. In addition to these, however imposing their array, we must, in every case, have one at least of the certain signs, before we can, with all confidence, assert that the woman bears a living child.

If the child is dead, it is obvious that two out of the three signs are no longer available; but, in these cases, there may still be ballottement, or there may be present signs which are held to indicate the death of the fœtus, and which will be noticed in their proper place. The questions may be put to us: Is pregnancy probable in this case? or, Can you say with perfect confidence that the woman is not pregnant? The reply to such questions must be given with the greatest caution, and will depend very much on the correct appreciation of the various probable signs, and the exact value which attaches to each, or to each group of such signs. In most cases of doubt, some period will be given as the probable or possible time from which, if existing, the pregnancy must date; and it will be upon a careful analysis of the signs proper to such period of pregnancy as may thus be indicated, that our opinions will, in the end, be formed. With a view of facilitating such an investigation, the following table has been drawn up, in which is given the average period at which the various signs are available.

TABLE SHOWING THE SIGNS OF PREGNANCY AT VARIOUS EPOCHS.

Weeks.	Disturbance and Alteration of Function.	Position and Anatomical Relations of the Uterus.	Condition of the Os and Cervix. 1. In Primiparæ; 2. In Pluriparæ.	Special Characteristics.
1st to 8th.	Suppression of Menses (occasional exceptions). Swelling and pain in Breasts. Morning sickness, and other digestive derangements.	Volume and weight increased: Lower in pelvis: Os displaced downwards. Very slight hypogastric flattening and depression of Umbilicus. Fundus still below the level of the pelvic brim.	Investing mucous membrane becomes thick and œdematous. Os in Primiparæ becomes round; in Pluriparæ it is more open, and admits the point of the finger.	Turgescence and increased temperature of external genitals and of Vagina, the mucous membrane of which becomes darker.
9th to 16th.	Marked enlargement of Breasts, with prominence of nipple, and slight deepening in color of the Areola.	Fundus passes brim about 12th week, and is midway between pubis and umbilicus at end of 16th. It is distinguished by palpation and percussion. Less depression of Umbilicus, and less hypogastric flattening. Os reached with more difficulty, and is situated somewhat to the left.	Softening extends gradually from mucous membrane to tissue surrounding os. Orifice closed in Primiparæ; in Pluriparæ still more open.	Uterine souffle about 16th week.
17th to 24th.	Areola becomes distinct, the Follicles projecting beyond the level of the skin. Morning sickness, and other digestive disturbances less. Certain effects of mechanical compression now often observed, such as varicose veins, and œdema of the genitals.	Fundus gradually rises; is a little beneath the umbilicus at the 20th, and a little above it at the 24th week. Rounded central tumor in hypogaster, becoming gradually more apparent. Umbilical depression almost effaced. Os and Cervix still higher.	Softening further invades the cervix. In Primiparæ, os circular, smooth, and closed. In Pluriparæ, irregular, nodulated, and usually admitting, without difficulty, the point of the finger.	Projections of fœtus may be felt. Active movements may be experienced by mother about the 17th week, and felt by the accoucheur some weeks later. Pulsation of fœtal heart about 18th week. If the head presents, Ballottement can be made out about the 18th week. Dark lines on abdomen; and secondary areola may also be observed.

25th to 32d.	Deeper color of the Areola, with complete development of the glandular Follicles. Morning sickness rare Effects of mechanical compression more marked. Vagina often granular, with leucorrhœal discharge.	Fundus at 28th week about two inches, and at 32d three inches above umbilicus. Uterine tumor larger, and directed to the right side. Umbilical depression completely effaced. Os and Cervix still ascending, and directed backwards, and a little to the left.	Softening of Cervix complete. In Primiparæ, the os internum yields, and the cavity of the cervix becomes encroached upon from above. In Pluriparæ, os internum remains closed, but the cavity of the cervix admits the finger with ease.	All the above conditions become more intensified and obvious.
33d to 38th.	Disorders of Digestion and Respiration, the result of pressure by the distended uterus.	Fundus rises as high as the ensiform cartilage, and on each side is behind the false ribs. Umbilicus inverted, and protruding. Os reaches its highest point. Inferior segment of uterus becomes thinner, so that the presenting part of the child can be more easily felt.	In Primiparæ, marked and progressive shortening of cervical cavity, which, about 34th week, has lost half its length. External os admits point of finger. In Pluriparæ, internal os only yields at 36th week, when the shortening of the cavity rapidly progresses Lips of os thick and soft, and admitting the finger as far as the membranes.	As in the 7th and 8th month—with the exception of Ballottement, which becomes impossible.
39th and 40th.	Functional disorders disappear. Œdema and varicose condition of genitals increased. Pain and difficulty in walking.	Fundus falls downwards and forwards, the Os moving at the same time downwards and backwards in the true pelvis. Prominence of umbilicus reaches its maximum. Presenting part very distinct, and low in pelvis.	In Primiparæ, the cervix completely disappears; the lips become very thin, and almost membranous. The os opens a little. In Pluriparæ, the lips remain irregular, and of considerable thickness to the last.	All the appearances due to stretching of the abdominal parietes become more distinct.

CHAPTER X.

DURATION OF PREGNANCY—SUPERFŒTATION.

DURATION OF PREGNANCY: IN COWS AND MARES: IN WOMEN—PROTRACTED PREGNANCY: CASES OF—DIFFERENCE IN RATE OF DEVELOPMENT—MODE OF CALCULATING THE PROBABLE TIME OF DELIVERY: CALCULATION FROM LAST MENSTRUATION TO BE CORRECTED BY PERIOD OF QUICKENING—SUPERFŒTATION: TO BE DISTINGUISHED FROM SUPERFECUNDATION—PROOFS OF THE LATTER—TWIN PREGNANCY IN RELATION TO THIS SUBJECT—CASES—CONCLUSIONS.

THE Duration of Pregnancy is a subject which, in so far as regards the human race, is enveloped in no little obscurity. Our chief difficulty arises from the fact, that it is only in a very small number of cases that the date of fertile coitus can be accurately ascertained; and, further, in the majority of these, it is probable that the data are open to doubt: for example, when an unmarried girl says she is pregnant from a single coitus, may we not suspect that she does so to palliate her fault, as she can no longer conceal her shame? and the more closely, indeed, do we investigate this class of cases, the more convinced do we become that many instances of so-called pregnancy from a single act should not be admitted in evidence. The proof, however, which is afforded by undoubted cases of this nature, and that which is derived from other sources, is sufficient to show that there is a very considerable difference in the duration of pregnancy, consistent with maturity of the fœtus and a normal state of the pregnancy from first to last.

In all the Mammalia except Man, one coitus coinciding, as it does, with the period of rut, is generally followed by conception. This admits of observations of an exact kind in the case of many of our domestic animals; by means of which, indeed, much of what is known in this domain of physiology has been, in a great measure, established. In 1819, M. Tessier submitted to the Académie des Sciences at Paris the result of a series of investigations of this nature, which are of some interest as illustrating by the light of comparative physiology the question which we are now considering. The observations were, in fact, instituted with the object of determining the possibility of protracted gestation in the human race. The following are the leading results:

OF 140 COWS:

14 calved between the 241st and the 266th day.
53 " " 269th " 280th "
68 " " 280th " 290th "
5 " " 290th " 308th "

The extreme difference between the births, in an animal in which gestation is only a little more protracted than in women, being thus 67 days. An extended series of observations of a similar nature, and yielding similar results, was conducted by the late Lord Spencer:

Of 102 Mares:

3	foaled	on the	311th day.		
1	"	"	314th "		
1	"	"	325th "		
1	"	"	326th "		
2	"	"	330th "		
47	"	between the	340th	and the	350th day.
25	"	" "	356th	"	360th "
21	"	" "	360th	"	377th "
1	"	on the	394th day.		

the extremes in this case embracing a period of no less than 83 days.

Of course, as regards the cases in which the birth took place much earlier than the ordinary period, it may be said that they were examples of premature delivery; but even if, by striking them off, we remove this possible fallacy, there still remains a sufficiency of facts to prove that, in those animals, there is considerable latitude as to the exact day at which labor may be anticipated. And, if this be the case in animals, where sexual excitement is in abeyance during the whole period of gestation, is it not even more likely to obtain in the case of women, in whom sexual excitement persists, and who are exposed to moral and social influences, and to diseases, one and all of which may act as disturbing influences, and thus cause irregularities in the period of delivery? And, in point of fact, this has been shown to be the case, by numerous examples which have been carefully noted by experienced observers. The usual method of determining the approximate duration of pregnancy, it being impossible to fix the date of conception, is to make the calculation from the last day on which the menstrual discharge was observed. It was upon this principle, and selecting those cases only in which this starting-point could be exactly determined, that Dr. Merriman conducted his investigations, with the results which are quoted in almost every work on obstetrics. Of the 150 mature births observed by him—

5	were delivered	in the	37th	week	—255 to 259 days.
16	"	"	38th	"	—260 to 266 "
21	"	"	39th	"	—267 to 273 "
46	"	"	40th	"	—274 to 280 "
28	"	"	41st	"	—281 to 287 "
18	"	"	42d	"	—288 to 294 "
11	"	"	43d	"	—295 to 301 "
5	"	"	44th, the latest being the 306th day.		

In this most interesting and reliable table a difference is shown between the extremes of 51 days. The following table, of no less than 500 cases, by Dr. James Reid, is of no less interest, and is calculated like that of Merriman from the last day of menstruation.

Of the 500 cases

28	were delivered	in the	37th	week	—255 to 259 days.
48	"	"	38th	"	—260 to 266 "
81	"	"	39th	"	—267 to 273 "
131	"	"	40th	"	—274 to 280 "
112	"	"	41st	"	—281 to 287 "
68	"	"	42d	"	—288 to 294 "
28	"	"	43d	"	—295 to 301 "
8	"	"	44th	"	—302 to 308 "
6	"	"	45th	".	—309 to 315 "

The difference between the extremes being in this case no less than 60 days.

The results yielded by these two tables prove that, calculating in this manner from the last day of the last menstruation, considerable variations in the duration of pregnancy seem to occur. But such seeming variations must be viewed with caution. Our calculation is not here, as in cows and mares, from the very day and hour of coition, but is made in full knowledge of the fact that conception may have occurred on any one day of a period extending over more than three weeks. Such conclusions as may be admitted, upon an analysis of the cases of single coitus in the human species which are on record, tend to show pretty clearly that, although the range is less than in the lower animals, there is an undoubted variation within certain limits. Dr. Reid, in the series of papers from which the above table was taken, gives an analysis of 43 cases of single coitus which he had collected; but as we entertain grave doubts of the accuracy of such tables, for reasons already stated, we refrain from quoting it *in extenso*. According to it, delivery took place in from 260 to 300 days, a range of no less than 40 days, and the average duration of gestation is shown to be about 275 days.

The facts above cited seem to show that the question of the duration of pregnancy is one which is of the highest importance, not only in an obstetrical, but in a legal sense; and it is indeed upon the facts established by scientific and obstetrical research, and the opinions which are founded upon them, that the laws bearing upon the subject have been framed, and are interpreted in courts of law. One of the most interesting cases of this kind on record is the well-known Gardner peerage case, of which the following is a brief outline:

> "Lord Gardner parted from his wife on board of his ship on the 30th of January, 1802, and, having proceeded to the West Indies, did not see her again until the 11th of July following. Lady Gardner had been living in open adulterous intercourse with a Mr. Jadis, and on that account his Lordship obtained a divorce after his return, and subsequently contracted a second marriage. The case came before the House of Lords in 1825, when Allan Legge Gardner, the son of Lord Gardner, by his second wife, petitioned to have his name inscribed as a peer on the Parliament Roll. Another claimant, however, appeared in the person of Henry Fenton Jadis or Gardner, who alleged that he was the son of Lord Gardner, by his first, and subsequently divorced wife. He was proved to have been born on the 8th of December, 1802, and the question in view of the above facts simply was (as the possibility of the pregnancy dating from July was not put forward), whether a child born 811 days from possible intercourse, could have been the child of the deceased Lord Gardner. The medical evidence, as, unfortunately, it too often is in such cases, was very contradictory, but is particularly interesting as bringing out the opinions of the greatest obstetrical authorities of the day. Sir C. Clarke, Dr. Gooch, and Dr. Davis stated their belief that forty weeks (280 days) is never exceeded, while on the other hand, Drs. Blundell, Conquest, and Granville asserted that the period was in some cases undoubtedly exceeded, and to such an extent that they were warranted in admitting the possibility of the claimant, Henry Fenton Jadis, having been a ten and a half months child. Their Lordships found that the elder claimant was illegitimate, and that, consequently, the son of the second marriage was Lord Gardner. It must be admitted, however, that the moral evidence in this case had probably more weight than the medical."

Since this decision, the attention of the profession has been much more carefully directed to this subject, and probably no one at the present day would venture to assert that 280 days is the *ultimum tempus* *pariendi* which some legal authorities suppose it to be. Were we able to date from the moment of conception, which under no circumstances is possible to us, we could soon collect sufficient data to guide us in future. But we must not forget that, even in those cases in which the calculation is made from a single coitus, the time of insemination does not necessarily mark the time of fecundation, and there is good reason to believe, from what has been observed in the lower animals, that some days may elapse before the fertilizing principle encounters the ovum. Then, again, if we date from menstruation, we must admit the possibility of irregular menstruation prior to impregnation, in which case conception may occur six weeks or more after the last menstruation. And if we admit this, as we tacitly do in cases of married women who carry the child longer than usual, we are bound in common fairness to allow the same argument to those who wish to prove the possibility of protracted pregnancy. The following instance, from the writer's case-book, will serve to illustrate this:

> "Mrs. P., who before had borne one child, ceased to menstruate on the 11th of September. On the 23d of December, she had slight hemorrhage and other symptoms of threatened abortion. Nothing solid came away, and she was confined strictly to bed until all the symptoms had disappeared. Previous to this she had had morning sickness. In the course of the month of February, she felt motion, but did not note the date. Development went on as usual, and she enjoyed excellent health.
>
> "On the 17th of July I visited her, being somewhat astonished at the duration of the pregnancy. On examination I felt the outline and feet of the child quite distinctly, the latter moving vigorously in the right hypochondriac region, where the movements had subjected the mother to much annoyance. The os uteri was patent, so as to admit the point of the finger, and was quite cushiony and soft. The cervix was short, but quite perceptible. The presenting part could not be reached by the finger. On the 22d of July, 314 days from the last menstruation, a male child was born of average size and quite healthy."

In this case menstruation was habitually irregular, and there was often an interval of six weeks between the periods. If we assume therefore that impregnation occurred immediately before a menstrual period after an interval of six weeks (42 days), this would make the duration of pregnancy exactly 273 days.

The following case is of a somewhat similar nature, but is further interesting as affording an illustration of what we believe to be in many cases an essential element in determining the probable duration of pregnancy. The sensation of quickening is generally, as has been observed, perceived by the mother a little before the middle of pregnancy, and should always be accurately noted if possible. Were this done in every case, it would serve to correct errors which may arise from calculations based exclusively on the last menstruation. Had it been done in the following instance, some trouble and anxiety might have been saved, and the same remark might possibly apply with equal force to many of the so-called examples of protracted gestation:

> Mrs. M., who had previously borne eight children, ceased to menstruate on the 18th of September. For some months after this she suffered much from spasmodic asthma, which seemed to be associated with the pregnancy, of the existence of which she was for some time doubtful. The movements were said to be less vigorous on this than they had been on former occasions, but in all other respects she progressed very favorably, the asthma becoming much less in proportion to the advance made

in the pregnancy. The calculated time having long passed, and a more careful questioning having been adopted, it was found that quickening dated *from the first week in March at soonest*. Only one menstruation had occurred since her former pregnancy.

July 24th.—On examination, the os is found to be patent. A few pains have occurred. Head easily reached and presenting.

July 31st.—Child born at 5 A.M., 322 days from the last menstruation.

If impregnation had not occurred in this case, we may suppose it possible, if not probable, that the second menstrual period after the former confinement would have taken place between six and seven weeks after the first, and that impregnation had occurred immediately before it—say on the 24th of October, or 280 days before birth.

The last case which we shall cite in illustration of this subject is one of special interest, inasmuch as it is calculated from a single coitus under circumstances which leave no room for doubt as to the facts, and in which the pregnancy was unusually prolonged:

The subject of the case in question, Mrs. R., had previously had seven children, one having been a transverse presentation, and several having been delivered with the forceps. Her general health being indifferent, she dreaded greatly another pregnancy, and on that account absented herself from her husband's bed. In the month of March the latter went on a visit to the country, where Mrs. R. visited him for a single night, circumstances having arisen which obliged her to go to the Continent, where she remained for two months. The date of this visit was the 2d of April, and before her return home she was convinced by previous experience that she was pregnant. The date of the last menstruation was a little uncertain, but was about the 27th of March. To the astonishment of every one who knew the circumstances the pregnancy continued far beyond the ordinary limits, until, on the 22d of January, she was delivered of a very large male child, weighing 12 lb. 3 oz , 295 days from what we believe to have been beyond all doubt a solitary coitus. An interesting point in the case was the great size of the child, indicating, as it might be, that it had been retained within the womb beyond the ordinary period of maturity.

Many writers, among them Scanzoni, maintain, and some observations seem to confirm their view, that the rate of intra-uterine development is not always the same; and that children born mature at an earlier period than usual are to be described as exceptional (*Graviditas Præcox*), while the contrary class of cases are those in which, development being slow, maturity is not reached until a period considerably beyond the average (*Graviditas Serotina*).

The facts just stated furnish a general confirmation of the observations of those whose conclusions are embodied in the tables which we have given. The maximum, according to Reid, is 293 days, as deduced from his cases of single coitus; our own case above quoted is 295; and Merriman's maximum of 306 days from the last menstruation, will, if calculated from the probable time of conception, give about the same result. In Scottish Law, and in the French Code, the period of 300 days is fixed as the utmost possible limit, and in Prussia 301, so that in these countries the child of a woman who is delivered 302 days after the death or proved absence of her husband is declared illegitimate. Difficult as it is, and always must be, to fix precisely the limit, we are inclined to think that these laws are just; for while it is the object of the law from one point of view to protect the innocent offspring from the brand of illegitimacy, if it be possible to do so, it is in like manner the duty of those who administer the law, not rashly to confer the position and privileges of legitimacy upon the fruit of adulterous intercourse. In English Law, no period or limit is fixed, and cases when they arise fall to be decided in the light of the medical evidence or experts, and of the moral and collateral aspects of the case. In America, a more liberal view is taken, to judge from some legal decisions which are quoted by Taylor, where paternity was held to be proved in two cases, the duration of the pregnancy from coition being shown in one to be 313, and in the other 317 days. It is possible that the American views on this subject may have received their color from the extreme views entertained by one of the most eminent obstetricians in that country, Dr. Meigs, of Philadelphia, who has expressed a belief that gestation might continue for a year or even more.

With reference to what has been said as to the probability of 300 days being a liberal interpretation of a law of nature, it must not be forgotten that some very able obstetricians in this country have expressed a contrary opinion. The names of Simpson and Murphy are a sufficient guarantee that the cases cited by them, on which they found their opinion that pregnancy may be prolonged considerably beyond the period named above, are free from the suspicion of careless investigation; but, on the whole evidence before us, we conclude that the extreme cases must be disallowed, as the sources of fallacy are too numerous to warrant us, without clear evidence, to sanction the extension of the possible limit.[1]

Speaking in general terms, pregnancy may be stated as lasting, under ordinary circumstances, for nine calendar months,—from 273 to 276 days, according to the length of the months which intervene. But, as we are ignorant of the date of conception, and can only make the above calculation under very exceptional circumstances, some other mode has to be adopted in practice. It is a matter of some importance to the practitioner, and one on which his comfort in no small measure depends, to be able to forecast his obstetrical engagements; and this subject is on that account, to him one of special interest. A long series of careful examinations conducted by independent observers, seems clearly to show that the period of impregnation is usually about a week after the cessation of a menstrual period. A ready method of reckoning, which is founded on this belief, is recommended by many German authors, and is very generally practiced by nurses in this country. It consists in taking the date of the last menstruation, reckoning three months back, and adding seven days. For example, a woman has ceased to menstruate on the 8th of June; three months back (or nine months forwards), gives the 8th of March; to this add seven days = 15th of March, which will be found, in a large number of cases, to be within a few days of the actual time of delivery.

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[1] Some reliable information, in regard to this subject, may, as we believe, be derived from the observation of pregnancy in Jewish women. The author is mainly indebted to a very able physician and accoucheur of that persuasion for the following information. Among Jews, the sexes are separate during menstruation, and for seven clear days thereafter. The shortest period allowed for menstruation is five days, even should it last only for an hour or two, so that the *minimum* period of separation every month is twelve days: and, in anything approaching menorrhagia, of course much longer. This law is observed by the vast bulk of the Jewish women; the exceptions are very few. After the period of separation, whatever that may be, the woman, besides an ordinary bath for cleansing purposes, must take what is called the "bath of purification." She simply dips in this, but does not wash. This gives a fixed day, from which a Jewish woman reckons, as she knows the day she went to *the* bath, and calculates accordingly. Any one who may have an opportunity of making observations in this direction, will find, 1st, that Jewish women calculate more accurately as to the duration of pregnancy; 2d, that, according to their experience, the duration of pregnancy seems to be rather less than is usually supposed; and 3d (although this has less to do with the subject more immediately under consideration), that, as has been observed by a late writer in Germany, this frequent and protracted abstention from sexual intercourse may be admitted as a possible cause of the undoubted vitality of the Jewish race.

For greater exactness, as well as for the purposes of general scientific accuracy, it is better to make the calculation in such a manner as may enable us to compare one case with another, and at the same time reduce possible error to a minimum. This is done by calculating in each case 280 days, or ten lunar months, from the last menstruation, which is equivalent (by deducting seven days) to nine calendar months from the assumed date of conception. This calculation, simple as it is, implies a certain amount of trouble, to reduce which various tables have been constructed. Such tables, however, as are given by Naegele, or by Murphy, after Dr. Ryan, are too elaborate to be of any real practical everyday use, and to read them requires almost as much trouble as to make the original calculation in each case. A much more useful and satisfactory one is the following, which is very easily read, and from which the calculation necessary may be made in a few seconds.

Around the circle are arranged in their order the months in the year, with the number of days in each. The number placed below each month gives the number of days which must be added to the nine preceding months in order to make up 280 days. If the month of February in a leap year is included in a pregnancy, it is estimated by the number in brackets.

We reckon, in order to find the next 280 days from the starting-point (the last day of menstruation), nine months forwards (or, more simply, three months backwards), and add to the date thus reached the number standing below the name of that month.

Example 1.—Last menstruation, the 10th of February, count three months back = November 10th + 7 = November 17th (in leap year, November 10th + 6 = November 16th).

Example 2.—Last menstruation, 24th March, = 29th December, = 280 days.

Example 3.—Last menstruation, 30th September, 1863, = July 7th, 1864, = 280 days.

Example 4.—Last menstruation, 31st May, 1863, = March 7th, 1864, = 280 days.

The last example shows how to proceed when, at the end of the month, there may be a doubt as to the calculation.

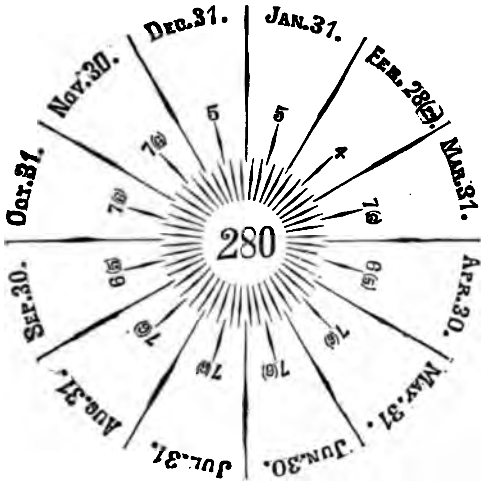
The 31st of February is equivalent to the 3d of March, which + 4 = 280 days.

An equally simple calculation may be made when, in medico-legal investigations, we want to calculate backwards from the day of birth to the probable cessation of the menses 280 days previously. In this case, we count three months forwards, and *subtract* the number standing under the birth month.

Example 1.—Birth, 31st October, = Menses, January 31st,—7 = January 24th, or 280 days.

Example 2.—Birth, 20th April = Menses, July 20th,—6 = July 14th, = 280 days.

FIG. 90.



To calculate the duration of pregnancy. (After Schultze.)

Impregnation may take place at any time during an intermenstrual period. It is agreed, however, that the time at which it most frequently occurs is about seven days after the last menstruation, that next in point of frequency being immediately before the succeeding menstrual period. It will be observed that we have thus a range of three weeks within which impregnation *may* occur, even when the menstruation is quite regular, and this fact serves to explain, as we believe, the great majority of those cases in which a woman appears to carry the child for three weeks beyond the calculated time. Indeed, when a woman goes one week beyond the 280 days, we have come to look upon it in practice as by no means unlikely that she will carry her child for fourteen days more.[1]

The errors which arise from this method of calculation are of such frequent occurrence, that we find it of great advantage, when practicable, to correct this observation by another, as has already been incidentally observed,—to wit the quickening. In regard to this sign of pregnancy, there certainly exists much self-deception on the part of women, and, moreover, it is, as Dr. Reid remarks, seldom that they can tell us the exact day on which they first feel it. The vulgar belief is that the period when it is first felt indicates the middle of pregnancy, or four and a half calendar months, but the opinion of the most experienced accoucheurs is that it is, as a rule, perceived about the end of the fourth calendar month, or about a fortnight before the middle of the term. About the seventeenth or eighteenth week, therefore, may be set down as the most usual period. Its value, as a sign of the duration of pregnancy, is unfortunately much diminished by the long period during which it may for the first time be experienced; but, still, its value is very considerable in this way, that, if we have a case to deal with of apparently protracted pregnancy, it is unlikely that any considerable error should arise both from the quickening and the menstruation in the same case. By this precaution, therefore, the risk of miscalculation is certainly diminished.

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[1] This term of 280 days is of special interest from another point of view, as marking the tenth menstrual period from conception. (See "Causes of Labor," Chapter XV.)

When, as is usual in midwifery practice, the services of the accoucheur are engaged beforehand, he should, for his own satisfaction, uniformly ascertain the date of the last menstrual flow, and not be content with the scanty information usually given that she expects her confinement "early in the year," or "about the middle of June." Having ascertained the fact and noted it, he must then inquire as to the quickening, and if the information is sufficiently clear, he must note that also. Or, if the woman has not yet arrived at the period of her pregnancy when this sign manifests itself, she must be requested to make an accurate note of her quickening, with a view to the subsequent information of her medical attendant. With the facts thus disclosed before him, he may then, by an application of the principles already laid down, make a calculation which, with ordinary care and discrimination, will rarely mislead him.

Superfœtation.—It is generally, although not universally, admitted by those who have devoted most attention to the subject, that it is quite possible for one impregnation to succeed another, in the same pregnancy, within a certain limited period, and it is all but proved that, in this manner, twin pregnancies do occasionally occur. This is, however, not superfœtation, but merely *superfecundation;* the essential distinction between the two being, according to Scanzoni, that the former must be held as occurring after the formation of the decidua, while the other is presumed to occur before that membrane is developed. Under the head of superfecundation we must class those cases, of which many are on record, of women who have borne twins of different colors, after having had connection successively with a negro and a white man. A case of this kind was reported in the *Philadelphia Medical Examiner.* Scanzoni, who rejects even the idea of superfecundation, explains such cases on the principle that children sometimes resemble the father, and, at other times, the mother, both in features and complexion. In twin pregnancies, one child occasionally resembles the father, while the other resembles the mother. It seems, on this ground, quite possible to him that all that is necessary for the production of a black child and a white one is cohabitation between a black man and a white woman; or, what is vastly more common, a white man and a black woman. Few, however, appear to agree with Scanzoni in his view; and, as we have already said, the possibility of superfecundation is, in consequence chiefly of what we know from comparative physiology, pretty generally admitted.

It is otherwise with Superfœtation, the possibility of which has been vigorously opposed by Wagner, who termed it a physiological impossibility; and by most of the modern English writers, among whom we may mention Drs. Ramsbotham and Churchill. The idea implied is, that a woman who already bears within her womb a living fœtus may, at a stage of pregnancy more or less advanced, again conceive, and thus carry simultaneously the fruit of two conceptions, between which there must be a considerable interval. A careful analysis of the so-called cases of superfœtation, and especially of the older cases, shows conclusively that, in most of them, the phenomena were quite consistent with the idea of ordinary twin pregnancy. Numerous cases are on record where, abortion having taken place, one twin has then been expelled, while the other has gone to the full time. Others, again, occasionally occur in which a mature child and a small withered one are born together. But it needs no argument to show that, although instances such as these may excite surprise among the ignorant, they are quite in keeping with what is known of the physiology of twin pregnancy. A number of the recorded cases are so obviously to be accounted for in this way, that we are almost tempted to refer, without any further investigation, all such to the same category. But an impartial consideration of the numerous examples which have been advanced in support of superfœtation will not permit such a summary treatment of the subject.

Among the cases frequently quoted is one which was published in the "Transactions of the College of Physicians."

"Mrs. T., an Italian lady, who was married to an Englishman, was delivered of a male child at Palermo, on the 12th of November, 1807; and on the 2d of February, 1808, she was delivered of a second male child." Both children were said to have been born perfect, but a careful analysis of the whole facts as disclosed seems to show that the case in all probability comes under the class of twin pregnancies. Certain doubtful circumstances regarding the first infant, coupled with the fact of its early death, seem to point to the conclusion that it was born immature.

Dr. Möbus, of Dieburg, reports a similar case, the narrative of and remarks upon which we take from Taylor's well-known work on Medical Jurisprudence.

"A healthy *married* woman, about thirty-five years of age, was safely delivered of a girl on the 16th of October, 1833. The child is described as having been well-formed, and having borne about it all the signs of maturity. This woman, it is to be observed, had previously had several children in a regular manner. Soon after her delivery, and the expulsion of the placenta, she felt, on this occasion, something still moving within her. On examination, the mouth of the uterus was found completely contracted, and the organ itself so drawn up as to render it difficult to be reached; but the motions of a second child were still plainly distinguishable through the parietes of the distended abdomen. Her delivery was not followed by the appearance of discharge (lochia) or by the secretion of milk. The breasts remained flaccid, and there was no fever. On the 18th of November, *thirty-three* days after her first confinement, this woman, while alone and unassisted, was suddenly delivered of another girl, which, according to Dr. Möbus, was healthy, and bore no sign of *overmaturity* about it. The reporter alleged that this case most unequivocally establishes the doctrine of superfœtation. The two births took place at an interval of thirty-three days, and the two children were, it is stated, when born, equally well-formed and mature; but Dr. Möbus did not see the second child until twenty-

> four hours after birth. This may, however, have been a twin case, in which one child was born before the other. Dr. Möbus considers that the first child was born at the usual period of gestation, it being described as mature; and that the other, thirty-three days after that period, having been, in his view, conceived so many days later than the first child. If, however, we imagine that in this, as it often happens in twin cases, one twin was more developed than the other, and that the more developed was the first expelled; or that it is not always easy to compare the degree of development in two children, when one is born before the other, and the two are not seen together, we shall have an explanation of the facts, without resorting to the hypothesis of a second conception after so long an interval. As to the signs of *overmaturity* alluded to, they are not met with. If we are to believe authentic reports, a child born at the thirty-ninth week cannot be distinguished from one born at the forty-third or forty-fourth week, and children born at the full period vary much in size and weight. A longer time may be required to bring children to maturity in some women than in others; and in a woman with twins, it is well known that two children may arrive at the same degree of maturity within different periods—one requiring perhaps several weeks longer than the other for its full development."

In a most interesting paper by Dr. Bonnar of Cupar-Fife,[1] a number of cases are given in which children, born in wedlock, succeeded each other with very unusual rapidity. The question of superfœtation is here looked upon from a different point of view, in reference more particularly to the period after parturition, at which the female procreative organs are again capable of exercising their functions. Dr. Bonnar gives three cases, all occurring in families of rank and position, but we do not think it necessary to repeat the names as some of the parties are still alive. In these cases, there intervened between the two deliveries 182, 174, and 127 days, and all the children were sufficiently developed to be reared, and, without exception, to reach maturity. How are we to explain these facts? We know that impregnation may occur within a very short period of delivery, long before the mucous membrane has gone through the process described by M. Robin, and been restored to its normal state. But, in the case last mentioned, this would only give about four calendar months from an impregnation assumed to date from six days after the last delivery, an age at which it would not be possible to rear the child, even upon the assumption of its being a case of so-called *graviditas præcox*. If we reject this theory, and yet admit the facts, which we believe to be beyond question, there is only one other way of accounting for them, and that is to admit the possibility of superfœtation.

Now, in regard to much of what has been urged in evidence against the possibility of superfœtation, it must be admitted that it is either irrelevant or inconclusive. Many, even of those who admit the probability, within certain limits, of superfecundation, assume that a new conception is impossible—say in the second or third month—on account of mechanical impediments which exist so soon as the decidua is formed. We know, of course, that the complete development of the decidua reflexa is a barrier to the formation of another embryo within the pouch thus constituted, or, in other words, of an ordinary twin pregnancy; but the researches of Coste most conclusively show that neither the Fallopian tubes nor the cavity of the cervix are closed so as to prevent communication between the vagina and the ovary. Or, to speak more plainly, there is no mechanical, nor, if the function of the ovary be not arrested, is there any physiological *impossibility* that a new ovum might be fertilized, at any period prior to that at which the decidua vera and the decidua reflexa come into contact, and be developed in a special decidual sac. But some of the cases last cited, if they are to be taken as cases of superfœtation, would seem to point to a new impregnation at a period later than that at which the two decidual layers come into contact; a difficulty which is ingeniously got rid of by Dr. Matthews Duncan, who says, "if we suppose, in an instance of this kind, that the first child is born prematurely, but within the limits of viability, we thus gain two months; and if impregnation may take place between two and three months after conception, we have thus four or five months of interval accounted for between the births of successive viable infants."

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[1] Edinburgh Medical Journal. January, 1865.

It is admitted on all hands that superfœtation may take place in cases of extra-uterine pregnancy. This, taken in connection with the facts hitherto ascertained with reference to menstruation during pregnancy, seems to indicate pretty clearly that the function of the ovaries is not necessarily interfered with in the course of gestation; but, at the same time, cases of this nature must be considered as standing by themselves, and not affecting directly the ordinary question of superfœtation. An example of this is reported by Montgomery, in which, while the product of an extra-uterine gestation remained encysted within the abdomen, the woman bore three children, one of whom lived. A similar case has been recorded by Dr. Steigertahl; and another still more interesting by M. Cliét, of Lyons, in which a woman died suddenly, and, upon dissection, an extra-uterine fœtus of five months was found in the abdomen, while a fœtus of three months occupied the uterus.

In another group of cases, of which many are on record, a second impregnation takes place, and development goes on within the unoccupied cavity of a double uterus. Of these, few present features of greater interest than one which was brought under the notice of the author by Dr. J. Harris Ross, of Brighton. It was embodied by him in his graduation thesis at the university of Glasgow in 1871, and was subsequently published in the *Lancet*. The following is Dr. Ross's report:

> "Mrs. C——, the subject of these remarks, is a woman aged thirty-three. She has been married fourteen years; and, previous to the circumstance I am about to relate, had been delivered of six children. With the last three I was the medical attendant; but had never before had the opportunity of examining the uterus, as the child on each occasion was quite at the outlet of the vagina when I arrived at her house. With the exception of once (when she was prematurely delivered of a seven months' child) the labors were all natural, and she always made a good recovery.
>
> "She sent for me in May, 1870, as she had considerable hemorrhage. She told me that she was pregnant, and that she had not menstruated since the previous February. On examination, I found the os uteri very flaccid and partially open, and another opening close to the left of it, which I supposed to be an excavated ulcer, and the cause of the hemorrhage. As she objected to the use of the speculum, I ordered her to keep the recumbent posture, and to use an astringent injection, which I sent her, together with some tonic medicine. In a few days the hemorrhage ceased, and she got about her household duties until July 16th.
>
> "On the morning of that day she sent for me in a great hurry. I found her with

strong labor pains; and on making an examination, I found a bag of membranes protruding from the uterus, which ruptured during my examination. After this the pains left her. I saw her several times in the course of the day, but the pains did not return until about nine o'clock in the evening, when they were of a very feeble character. On examination at this time I found another bag of membranes protruding, which I ruptured, as I thought it might stimulate the uterus to contract. A head then presented, and, after some time, the pains being very feeble, a fœtus was expelled. On again examining, a leg presented, and after a while I delivered her of a second fœtus, and then of a double placenta—that is, one with two cords. The children were, I should judge, of nearer six than five months' growth. After I had removed the placenta, the patient exclaimed, 'I am sure there is another, Mr. Ross,' meaning another child. As the uterus felt rather bulky, I introduced my hand into the vagina, and my finger into the uterus, to make sure, but found the cavity quite empty. At this time the second opening in the uterus was plainly to be felt. The whole course of this labor was very different from her other ones; the pains were very feeble and the labor unduly long: this I attributed to her having twins.

"About a week afterwards, the patient again declared that she had another child in the womb; but I pooh-poohed it, as I had made such a careful examination after delivery, that I felt certain I could not have left one behind. She, however, persisted in her statement. One day I went to see her, and my hand being very cold, I placed it upon her abdomen, when I plainly felt the movements of a child, and upon applying my stethoscope the fœtal heart was quite audible. On examination, per vaginam, the two openings could distinctly be felt, when it at once dawned upon me that I had got a case of double uterus, with both sides impregnated at the same time. On introducing a sound into the apertures, there was no doubt they both opened into a cavity or cavities, but, as she was still pregnant, I did not then push the matter further. When laid flat upon her back the tumor in the abdomen was decidedly more to the right than the left side. As there was now no doubt about her being pregnant, I told her to send for me directly she was in labor.

"She went on well until the morning of October 31st, when she sent for me at 6 A.M. On my arrival, I found the head on the perineum, with the membranes protruding. I ruptured them, and delivered her of a female child of full growth in about a quarter of an hour afterwards. On examining the uterus (after removal of the placenta) I could get my thumb into one opening, and, by a little manipulation, my finger into the other, and could distinctly feel a septum between them. She stated that she had menstruated three times since her miscarriage of twins in July. Both mother and child made a good recovery."

The conclusions, then, with reference to this subject, at which we think we are justified in arriving, are,—1st, That in regard to superfecundation, this is a phenomenon the existence of which we see no reason to doubt; 2d, That in so far as cases of double uterus and extra-uterine pregnancy are concerned, Superfœtation is established beyond question; and 3d, That, with respect to other cases (to which alone, perhaps, the term superfœtation should properly be applied), while there is more room for doubt, and while a large number of recorded cases are merely twin pregnancies, a sufficient number of authentic examples are on record to establish a strong presumption that, up to the period when the decidua reflexa comes into contact with the decidua vera, and, probably, until the two have become intimately adherent, there is a possibility of a new impregnation. Beyond this period we believe it to be impossible.

The subject is, however, so veiled in obscurity, that we hesitate to deny the possibility of error, or to admit, unreservedly, the doctrine of superfœtation. At the same time, we must not urge too far mere improbabilities as against rational proof. Much, we admit, must be established in regard to the matter, before the doctrine can be expected to obtain universal credence; but we apprehend that the confident opinion of those who reject it, in face of ascertained facts, is, to say the least, decidedly premature.

CHAPTER XI.

PLURAL PREGNANCY.—EXTRA-UTERINE PREGNANCY.

PLURAL PREGNANCY—MODE OF IMPREGNATION—TWINS: DISPOSITION OF THE MEMBRANES AND PLACENTA IN: DIAGNOSIS OF: RELATION OF TO SUPERFŒTATION—TRIPLETS, ETC.—EXTRA-UTERINE PREGNANCY—VARIETIES OF: OVARIAN: TUBAL: TUBO-OVARIAN: ABDOMINO-TUBAL: TUBO-UTERINE, ETC.: ABDOMINAL—CAUSES OF EXTRA-UTERINE PREGNANCY—DEVELOPMENT OF THE OVUM AND ITS COVERINGS—SYMPATHY OF THE UTERUS—SYMPTOMS—PROGRESS OF IN DIFFERENT VARIETIES: RUPTURE OF THE SAC: PERITONEAL INFLAMMATION: DISCHARGE OF FŒTAL DÉBRIS—TERMINATIONS—TREATMENT.

THE term Plural Pregnancy may be held to include all cases in which two or more germs are fertilized, simultaneously or nearly so, and are together developed within the uterine cavity. The products of conception in these cases are termed twins, triplets, quadruplets, &c., according to their number. It has been observed that certain women are peculiarly prone to plural conceptions; that those, for example, who have once borne twins are much more likely to carry two children again than those who have not. Whether such pregnancies are or are not the result of separate acts of insemination, is a question in regard to which we cannot venture beyond conjecture. Many facts, such as the birth of twins of different color, have been observed, which seem to show that successive acts within a limited period may be the cause of the impregnation of separate ova. But it is in the highest degree improbable that this is always the case, for there is no reason to believe that, if the semen comes into contact at the same time with two mature ova, one only is to be fecundated, and the other passed over. Indeed, in cases of double yolk, where twin pregnancy occasionally arises, it is apparent that what may suffice to fecundate one germ, can scarcely fail similarly to act upon the other. We shall not pause here to consider whether or not we are to explain the fact of the frequent unequal development in multiple pregnancies by the doctrine of superfecundation, but nothing is so common in this class of cases as to find one child well developed and vigorous, while another is weak and puny.

Twin Pregnancies occur once in about 75 to 80 cases, and triplets certainly not oftener than once in 5000. Cases where the number of children is greater are extremely rare. It was for long doubtful whether two embryos which were being simultaneously developed belonged to the same or different ova, and whether, in the last case, these ova proceeded from the same ovary. Modern research has in reference to these points established the following propositions: 1st, that two yolks are occasionally found in a single ovum; and that the germs contained in them are probably simultaneously fertilized: 2d, that two ova may exist within a single Graafian vesicle, from which, on its maturity, they may escape and be fertilized, together or successively: 3d, that two ova may be formed within two Graafian vesicles in the same ovary, or one in each ovary, the latter of which is proved by the simultaneous occurrence of pregnancy in each cavity of a double uterus (see Dr. Ross's case, quoted in Chap. X), and by the existence of two corpora lutea, in the same stage of development.

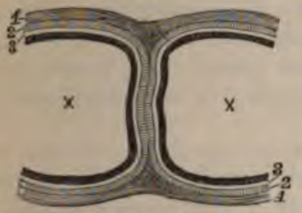
The following varieties of twin pregnancy, the distinction between which depends on the arrangement of the membranes, cord, and placenta, are those which are generally observed in practice. The essential difference between them depends, as a little careful examination will show, upon whether two ova have been separately impregnated, or a single ovum has contained two germs.

The cases which occur most frequently are those in which two distinct ova are impregnated, whether these come from separate ovaries, from two Graafian vesicles in one ovary, or from a single Graafian vesicle. Each of these becomes imbedded in the mucous membrane of the uterus, and the decidua reflexa rises round it in the usual way. In the process of growth the two tumors approach each other and come into contact, forming thus a partition between the two cavities, which originally consists of six layers, the decidua, chorion, and amnion, proper to each embryo. It would seem, however, according to the observations of Guillemot and others, that the decidua forms a very thin layer in the partition, or is absorbed, so that the partition at maturity consists of four layers only, consisting of the amnion (3 3) and the chorion (2 2) on each side, the whole mass being enveloped in a single decidua (1 1). In these cases the placentæ, developed, as will be remembered, on the maternal and fœtal sides, from the decidua and chorion respectively, are sometimes completely separated the one from the other. In other instances, again, they are fused together into a single mass, or are united by a sort of membranous bridge. But, as a rule, in spite of this continuity of tissue, there exists no vascular communication between the two.

In another class of cases, which are of comparatively rare occurrence, there is a chorion (Fig. 92, 2 2) common to both embryos, each, however, being inclosed in its own amnion (3 3), the common decidua (1 1), surrounding the whole, as in the former case. In these instances there is a single placenta, and very frequently ramifications exist between the branches of the two cords. There can be no doubt that here there must have been impregnation of two germs within a single ovum; or, in other words, they are cases of double yolk.

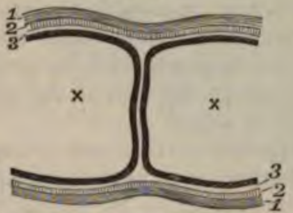
It occasionally occurs that two embryos exist in a common amnionic cavity,—a fact which it is difficult to explain on any other hypothesis than that they originally belonged to the former class, and that the amnionic partition in Fig. 92 is absorbed in the course of development. If we could admit that the doctrine propounded by M. Serres was correct,—that the amnion exists, in the first instance, as an independent vesicle, and that, subsequently to its complete development, the fœtus comes into contact with it, and depresses its surface so as to envelop

FIG. 91.



Diagrammatic representation of partition in twin pregnancy (1st variety).

FIG. 92.



Twin pregnancy (2d variety).

itself in a double layer, as takes place in the case of the serous membranes and the viscera which they invest,—we might be able to explain the occurrence. In the present state of our knowledge, however, on the subject of Ovology, we are at a loss to account for the presence of two embryos in one amnionic sac on any other theory than that which we have mentioned. But we cannot agree with those who pronounce it to be impossible, or irreconcilable with the views of development which have been given in an earlier section of this work. For, while we are constrained to admit the improbability, we cannot subscribe to the impossibility, of the development of two embryos on a continuous surface of the germinal membrane,—both being included within the cavity formed, in the usual way, by the amnionic folds. The two cords have generally been observed, in these cases, to spring from separate points of the placenta; but they have been found, in a few rare instances, to spring from a common trunk, which bifurcates at a variable distance from the placental surface. In the cases of twin pregnancy in which one fœtus is deprived of an important part of its body, it has been frequently found along with a perfect twin in the same amnionic sac.

A fourth variety of twin conception is that which has been described by Olivier and others, under the name of *monstrosity by inclusion*. This consists in the presence within an otherwise perfect fœtus of the elements, more or less distinct, of another, which may be situated either within the abdominal cavity, or beneath the skin of the fœtus—usually in the neighborhood of the perineum or scrotum.

It is often possible, during the currency of a pregnancy, more especially during the weeks immediately preceding delivery, to recognize the presence of twins. Generally speaking, when there is, as is usual, a fœtus on either side of the uterus, the shape of the organ is less globular than usual, and there is more enlargement in the direction of the sides. The woman may complain of movement at separate points of the abdomen,—an observation which, although far from being conclusive evidence of the presence of twins, seems to be, in certain cases, of some practical value as a symptom. If the abdominal wall be thin, it may also be possible for the accoucheur to perceive these movements by palpation, and, in the course of the same examination, even to recognize the presence of a second fœtus. There is greater distension of the abdomen, and an aggravation of such symptoms as are the result of pressure on neighboring organs. The pulsation of the two fœtal hearts may be heard at different points on the abdominal surface. Ballottement is not practicable and the uterine souffle is unaltered. These signs are, however, often vague and unsatisfactory, even in those cases in which a suspicion of twin pregnancy has arisen; and, in the majority of instances, the fact of the plural pregnancy is only recognized in the course of labor.

Whether as the result of superfecundation, or simply of unequal development, cases are very frequently met with in which the infants are of different size. In others, the growth of one fœtus is arrested, and it dies. The results, in such cases, vary considerably, being influenced by various circumstances, among which we may assume that the mode of disposition of the membranes is not the least important. In a certain number of cases, the dead fœtus is retained, but there being no access of external air, no putrefactive change takes place. It becomes hard, withered, and mummified, and in this state it may be born with the mature fœtus at the termination of pregnancy. This may happen whatever may be the nature of the partition between the two, and even, as some believe, in the cases in which they are in a single amnionic cavity; but it is, we apprehend, likely that Baudelocque is correct, when he assumes that, in the latter, the death of the one necessarily places the life of the other in great jeopardy. In other instances, the dead fœtus acts as a foreign body, or in some other way incites the uterus to contract, the result being usually the expulsion of the living and the dead; or the dead fœtus is expelled, and the uterine action being arrested at this point, the living one is retained, and ultimately fully developed. This can, for reasons which a moment's reflection will render obvious, only take place when each fœtus is enveloped in a complete series of membranes. If there be a common chorion, and, *à fortiori*, if there be a common amnion, the expulsion of one necessarily involves the expulsion of the other. In yet another group of cases of this nature, both are retained; but when labor comes on, the mature and living child only is expelled, while the withered fœtus remains behind, and may possibly occupy the womb for a very considerable period. The cause of the death of one fœtus in these cases is very little understood, but, probably, they who believe it to be due to some form of degeneration of the placenta or the membranes, or to some disease in the fœtus itself, are correct in their supposition.

It has been observed, with reference to multiple pregnancies, that they frequently terminate before the full period of gestation has been reached. This we may assume to be due to the overdistension of the uterus, which excites it to contraction at a period somewhat earlier than usual. As a rule, both children are generally expelled in the course of the same labor, in some instances without even a pause in the uterine effort. This is, however, far from being invariable, as it is not uncommon for the action to cease, and to return again in eighteen, twenty-four, or even forty-eight hours, when the uterus is thrown anew into periodic contractions, and the labor goes on in a perfectly regular and normal manner. In very rare cases, the interval between the two births may extend to a period of weeks, or even of months, and there can be little doubt that many of these cases have given rise, on erroneous grounds, to a belief in the theory of superfœtation, the error arising from the fact that the immaturity of the first child is overlooked.

It is unnecessary to make further mention of the other varieties of multiple pregnancy, as the observations which have been made may be held, *mutatis mutandis*, as applicable to these also. To judge from the few cases in which observations have been made, it would appear to be rare that each fœtus, the number being more than two, is inclosed in its own complete sac. Several cases of triplets are, for example, recorded, in which one had a special sac, while the other two had a common amnion. In regard to the possible retention of one or more of them, we may well suppose, to judge from analogy, that any conceivable combination of the numbers is in this respect possible. The practical bearing of plural pregnancy on the progress of labor will be noticed hereafter.

Extra-uterine Pregnancy.—Although the cavity of the womb is the site which nature has specially prepared for the development of the fruit of conception, it occasionally happens that it goes through its characteristic phases of development elsewhere. Generally, in these cases, its growth is arrested at a stage considerably short of maturity; but many instances have occurred in which the full period of gestation has been reached, and some in which it has been considerably exceeded, although the cavity of the uterus was entirely empty, as in the virgin state. The ovum is, as has been shown, developed within the ovary in the Graafian vesicle; and what has been observed in the lower animals leads us to conclude that while yet it occupies that situation, and even before the rupture of the vesicle has occurred, impregnation may occur. On the bursting of the vesicle, the germ is received into the infundibulum or pavilion of the Fallopian tube, and is thence conducted slowly through the entire length of the tube, until it reaches the uterine cavity, where its subsequent development progresses until the moment of delivery. Such we know to be the law of nature. Constituting an exception to this law, the ovum may, however, be arrested at any point of its course, and there taking root, as it were, the vital processes of development go on, up to a certain point, as actively and as efficiently as if the ovum had passed on to its usual site. In other cases it may deviate from its normal channel, and, escaping between the fimbriæ of the Fallopian tubes, falls into the cavity of the peritoneum, to some portion of which membrane it attaches itself. These are the circumstances which constitute extra-uterine pregnancy, and cases as they occur are classified more or less elaborately according to the anatomical relations which the ovum assumes in its unwonted situation. The usual division is into Ovarian, Tubal, and Abdominal cases, with many subdivisions, the more important only of which will be noticed.

The existence of Ovarian pregnancy has, by Mayor, Velpeau, and others, been absolutely denied. The denial seems, however, to have been founded on the assumption, which we believe to be unwarranted, that impregnation is mechanically impossible without rupture of the Graafian vesicle. But even if rupture has taken place, there is nothing to prevent the changes in the ovum going on within the Graafian vesicle, which, in their progress, distends, and with it the tissue of the ovary. Careful dissection has discovered in the sac of these pregnancies not only the peritoneum, but beneath it the proper tissue of the ovary—facts which it is difficult, if not impossible, to reconcile with an idea other than ovarian pregnancy. Most writers on the subject divide ovarian pregnancies into two varieties,—"internal" and "external." Of these the former, which alone implies true ovarian pregnancy, includes all cases in which the ovum is fertilized and developed within the cavity of the Graafian vesicle; while the latter refers to those cases where the ovum lies upon the surface of the ovary, and is there arrested in its course. If, however, the ovum is developed on the surface of the ovary, it is, properly speaking, a variety of abdominal pregnancy.

Of all the varieties of extra-uterine gestation, the most common, by far, is the Tubal, which, for the reasons already stated, is precisely what we would anticipate. The ovum is, in its descent towards the cavity which awaits it, arrested, it may be at any one point of its course, and there contracts adhesions, forms its membranes and placenta, and is thus surrounded, in lieu of a uterus, with a sac which is formed of the dilated and hypertrophied walls of the Fallopian tube. For greater precision in description, various names have been assigned to such pregnancies, according to the exact point at which the arrest of the ovum takes place. Those quite at the fimbriated extremity of the tube, which either are originally, or come to be in course of time, in contact both with tube and ovary, are termed *tubo-ovarian* or *ovario-tubal*. Where, again, the ovum is stopped at the point where the tube first narrows, the fimbriæ having relaxed their hold on the ovary, the development may take place partly within the tube, where the placenta will probably be situated, and partly bulging into the abdominal cavity, in which direction the growth mainly advances. To this variety the name *tubo-abdominal* has been given. Between this and the uterine wall is the situation at which the ordinary and most common form of tubal pregnancy occurs. Several varieties have been described of cases in which the ovum has its seat in the immediate vicinity of the uterine cavity, of which the most important and interesting is the *utero-tubal*, where the ovum lodges in that portion of the tube which passes through the walls of the uterus. The development in such a case may be partly within the uterus and partly within the tube; or, when a little more external, it may develop actually within the parenchyma of the uterus, and, if projecting into the cavity, may be invested with a covering of muscular fibres derived from the uterus itself. This is, probably, the *Graviditas in substantiâ uteri* of the older writers.

Among the rarer varieties is that, of which an example is given by Burns, in which the placenta is found in its normal situation within the uterus, and the fœtus within the Fallopian tube; and, still more rare are those of which Hunter, Hoffmeister, and Patuna have given illustrations, in which the fœtus has been found in the abdominal cavity, and the placenta in the uterus—the two being connected by a cord which ran from the placenta for some distance within the Fallopian tube, and then perforated it to join the fœtus. These latter cases have been called *utero-tubo-abdominal*, and in reference to them, it is in the highest degree probable that they were originally cases of tubal pregnancy, in which the placenta had been developed within the uterus, while the fœtus had escaped into the peritoneum by rupture of the walls of the sac in which it had been contained. Another rare form has been described as *sub-peritoneo-pelvic;* in which it is assumed that the ovum, having been unable to enter the external orifice of the tube, has got between the folds of the broad ligament, and there developed itself. It has been justly observed that, if this variety does occur, a more favorable result may be anticipated than in the other forms; because, in such a situation, the débris of a dead fœtus may be more easily and more safely removed.

In Abdominal Pregnancy, the fertilized ovum escapes the grasp of the fimbriæ, and falls into the cavity of the peritoneum, to any portion of which membrane it may in fact become attached. We may thus find it firmly incorporated with the ovary, the broad ligament, the intestines, the colon, and any other parts to which continuity of tissue permits its access. The essential physiological difference between an abdominal case and the other varieties of extra-uterine pregnancy is that, in the former, the ovum is without any special covering which can correspond to that which, under other circumstances, it derives from the tube or ovary. It grafts itself, so to speak, upon the peritoneal surface of some viscus, or of the abdominal wall, and if it is subsequently covered with any sac which may be taken as the analogue of the uterus, that must be the result, physiologically, of special evolution, or, pathologically, of inflammatory action.

Little has been hitherto discovered which enables us to come to a satisfactory conclusion, in regard to any of the above varieties, as to the Causes of extra-uterine gestation. Many have believed that a shock or fright, or a blow on the lower part of the belly may, should this chance to coincide with the moment of conception, give rise to it, and they ground this belief on facts which women have from time to time communicated. No single observation affords, however, to this theory, even the shadow of a proof, and the so-called evidence on which it rests, may perhaps be attributed without impropriety to that love of the marvellous which exists in so many minds. We cannot doubt that certain pathological conditions might furnish the cause; and, in some instances, the existence of such pathological conditions has been established. Inflammatory action of any kind, induration, pressure exercised by morbid growths, spasm of the muscular fibres of which the tube is so largely composed, so as to cause stricture, are a few of a hundred such conditions which might be specified as *possible* causes of the phenomenon. The fact is, however, that in most of the cases in which a careful examination has been made, the course of the pregnancy alters so the anatomical conditions of the chosen site, that it is impossible to come to any satisfactory conclusion as to the original condition of the parts. Some very curious phenomena have been observed, showing that the ovum is sometimes very erratic in its course. How otherwise are we to explain the facts observed in Dr. Oldham's cases, in which there was a distinct *corpus luteum* on one side, and tubal pregnancy on the other, for we must accept, as Dr. Tyler Smith says, in reference to one of these cases, one of three explanations: "The unimpregnated ovule might have been swept by the cilia of the peritoneum from the right ovary to the fimbriated extremity of the left tube; this would be similar to what occurs in the Amphibia, in which the ova always traverse the abdomen to reach the oviduct. Or the left tube may have reached over to the right ovary and have taken up the ovule. According to the third explanation it might be that the ovule had descended the right tube, entered the uterus, and then ascended through part of the left tube by an antiperistaltic action, or by the ciliary currents which move from below upwards." The view which Dr. Smith preferred in regard to the case in question was the third; while Dr. Oldham and Mr. Wharton Jones were inclined to accept rather the second of the explanations offered. It is possible that some cases of extra-uterine pregnancy may owe their origin to some such peculiarities in the evolution of the ovule.

In every form of extra-uterine pregnancy, the ovum forms its own membranes, and goes through the various phases of evolution in all respects as if the pregnancy were normal. It is therefore in every case covered by its own amnion and chorion, without which indeed further development were impossible. For, if we reflect on the manner in which the main circulation of the embryo is established through the agency of the latter membrane, we cannot by any possibility agree with those who have maintained that in abdominal pregnancies there is no chorion. So far all cases are alike. But in regard to the further coverings of the fœtus which, external to those just named, are of maternal origin, and correspond to the decidua and the uterus, great differences exist according to the class of extra-uterine pregnancy to which each case is to be referred. It is probable that in tubal pregnancy the mucous membrane may form, as in ordinary cases, a special envelope strictly analogous to the decidua; but, whether we take this view of the case or not, it is clear that, in every instance, the sac within which is contained the fœtus and its special structures, is composed of the mucous, muscular, and serous layers of the Fallopian tube, which become distended, and at the same time hypertrophied, as the ovum grows. In true ovarian pregnancy, the sac must consist originally of the walls of the Graafian vesicle, and externally of the tunica albuginea and the peritoneum; and in the compound forms the sac may be partly tubal and partly ovarian, or partly tubal and partly uterine, the covering depending simply in each case upon the site at which the ovum becomes arrested.

Cases of abdominal pregnancy differ materially from all others in this respect, and stand on that account in a class by themselves. The ovum is not in this variety arrested at any point of the canal through which nature intended it to pass; but escapes altogether from that canal and falls naked into the great abdominal cavity, without any special covering whatever, unless it be some remains of the granular disk in which it was imbedded. Here, in the early stage at least, there can be no special covering, nor connection with the maternal parts other than mere juxtaposition, the result of gravity or some other accidental circumstance. If the ovule has not, prior to this, been fertilized, it will no doubt rapidly disappear, and be absorbed with the secretions of the peritoneal surface. But if, on the other hand, an independent vitality has been communicated to it by conception, it bears the life which it contains to some point accidentally selected, and having there grafted itself upon the subjacent part, the essential contact between the maternal and fœtal systems is established, and the subsequent stages of development ensue. There can thus be in the first instance, no sac whatever, and although it is not impossible that a special sac might be developed from the peritoneal surface, as under ordinary circumstances takes place from the mucous membrane of the uterus, no facts have hitherto been observed to show that the ovum in abdominal pregnancy has any sac external to the chorion. But, should rupture of the membranes of the ovum occur, the embryo, which usually escapes into the abdominal cavity along with the liquor amnii, instantly becomes a foreign body; and, by exciting inflammatory action, provokes the formation of coagulable lymph. This forms a sac around the ovum, inclosing it now in a special cavity, and protects the rest of the peritoneal surface from the dangerous effects of extensive inflammation, which would inevitably ensue from the prolonged contact of the fœtal remains.

Whatever the site may be, abdominal or otherwise, at which the fertilized ovum takes up its position, the speedy result is a marked increase in the vascularity of the contiguous parts. If, for example, it becomes adherent to the peritoneal surface of any portion of the bowel, the bloodvessels of that part will at once become the seat of a marked and wonderful hypertrophy. What were before minute twigs now become large venous trunks, and the arterial supply is of course proportionally augmented. The vessels being projected from the embryo to the chorion by means of the allantois, the vascularity of that membrane is at once established. Those of its villi which belong to the visceral surface undergo marked development, and contract still closer adhesions with the peritoneum. The whole of the tissues become at this point enormously developed, and thus the Placenta is formed, within which the interchange of gases and materials goes on smoothly and, for a time, safely.

During the development of an extra-uterine fœtus, certain changes more or less marked have been noticed to take place in the uterus at an early period of the pregnancy. These changes, in so far as they have hitherto been observed, seem to be identical with the preparatory process of which the uterus is the seat at the time of impregnation, and prior to the descent of the ovum. They consist in a marked increase in the size of the organ, in an equally marked increase in its vascularity, and in the characteristic thickening and hypertrophy of the mucous membrane, which is the first stage in the formation of the decidua. These symptoms are, however, of brief duration. The uterus, not receiving the expected stimulus which would have been afforded by the ovum on its arrival, falls into a state of quiescence, its bulk and circulation being speedily restored, or nearly restored, to the normal standard.

The Symptoms of extra-uterine pregnancy are far from being definite and distinct. Just at first, the changes which have been mentioned as occuring in the uterus would, no doubt, tend to suggest the idea of an ordinary pregnancy. The woman may, at this time, enjoy perfect health, disturbed only by some of the sympathetic digestive disorders which are so familiar. No reliance can be placed on the cessation of the menses as a sign, as, from the narrative of recorded cases, it would appear that the discharge ceases in about the same proportion of cases as it persists. Very generally, from an early period of the pregnancy, abdominal pain is complained of. This may take the form of an intermitting pain; but it is generally constant, and confined to a certain limited region, which may be any one point on the abdominal surface. As the case advances and the ovum grows, considerable discomfort may be caused by pressure, exercised by the tumor directly or indirectly on neighboring organs; causing, for example, if the tumor should encroach upon the pelvic cavity, difficulty in defecation and micturition. Morning sickness, and the various changes which have their seat in the breasts, are of constant occurrence; and, as the case goes on, a tumor may be felt which resembles, more or less closely, the gravid uterus, but which is frequently more irregular in outline, and situated more to one side than in the middle line. At the proper time, quickening takes place, and is soon succeeded by the pulsation of the fœtal heart. Should suspicion have arisen as to the nature of the case, it is probable that the absence at this time of the characteristics which are revealed in ordinary pregnancy by a vaginal examination might throw considerable light on the case. If the pregnancy goes on without accident or hindrance till the period which marks the ordinary limit of gestation, pains come on, which are periodic, and which are described by women who have already borne children as precisely similar to ordinary labor pains. "These pains," says Burns, "usually begin in the sac, and then the uterus is excited to contract and discharge any fluid it contains." This uterine effort, at the end of the ninth month, is a physiological fact of surpassing interest, and seems to us to afford strong corroborative evidence of the correctness of that theory which supposes that the cause of labor has its seat neither in the fœtus nor in the uterus, but is, probably, to be found in the ovary, and is generally to be looked for at the tenth menstrual period after impregnation. In weighing the symptoms in a doubtful case, a fact which has already been mentioned in reference to the question of superfœtation should be borne in mind, viz., that a second (uterine) pregnancy is quite possible; and, indeed, a most striking case is quoted by Montgomery from Primrose, in which a woman went to the ninth month of her seventh gestation, when labor came on as on former occasions, although, ultimately, it turned out that there was a prior abdominal pregnancy.

The cases, however, in which extra-uterine pregnancy is prolonged till the ninth, or even the eighth month, form a very small proportion of the whole. It is, in point of fact, an unusual occurrence when development in such a case continues beyond the fourth or fifth month; but on the other hand, cases are on record, which are apparently authentic, in which the life of the fœtus was prolonged within the abdomen for several months beyond the ordinary period. M. Deseimeris, whose memoir on this subject is justly considered as of great value, states that rupture occurs in more than three-fourths of all cases; that, in the tubo-uterine variety, it takes place, as a rule, before the end of the second month; in tubal, in the fourth month; later in ovarian pregnancy; and, in abdominal pregnancy, not till the eighth or ninth month. The usual crisis, then, in all such cases, which may arrive sooner or later in their course, is rupture of the sac and of the fœtal membranes, or of the latter alone in abdominal pregnancies.

The symptoms which follow rupture of the sac are of extreme gravity, and the result invariably is that the life of the woman is placed in extreme jeopardy. The rupture is frequently preceded by severe pains, which may continue for several hours. A sudden cessation of these pains is then observed to coincide with a notable diminution in the size of the tumor. This is succeeded almost immediately by pallor, dimness of vision, vomiting, syncope, and other symptoms which indicate severe internal hemorrhage. To these succeed loss of pulse, clammy sweat, convulsions, and death—or, the bleeding being arrested, the patient rallies and escapes the immediate danger of hemorrhage.

If, after rupture of the sac, the hemorrhage is limited in extent, or if something occurs to check it by favoring the coagulation of the blood, the death may not be immediate. Death may, nevertheless, take place, as the result purely of hemorrhage, after an interval of some days; whereas, if the flow of blood be effectually barred, the patient may rally, and the symptoms of impending dissolution may disappear. But the danger which has thus been averted is forthwith succeeded by another equally grave. The fœtus, the amnionic fluid, and the blood which has been effused arouse the most violent peritoneal inflammation, which rapidly runs its course, generally with a fatal result. Should the powers of nature be of sufficient energy to overcome this second assault, the effect of the inflammatory action is rather beneficial than otherwise, for the fœtus now becomes inclosed in a sac which is formed from coagulable lymph, the product of the inflammatory action, and which effectually shuts it out from the rest of the abdominal cavity. Within the new cavity, a process of disintegration or modified decomposition goes on in the greater number of cases. The presence of the fœtal débris excites anew inflammatory action, which probably extends to contiguous viscera, between which and the sac adhesions may be established. To this succeeds ulcerative absorption, which may result in the establishment of fistulous openings in the direction of the hollow viscera, or externally through the abdominal walls: or perforation may take place a second time into the peritoneal cavity, with little hope of any result other than a fatal one. But if the perforation take the direction first mentioned, we may have, for weeks or months, portions of the more indestructible fœtal structures, bones, teeth, and the like, discharged through the abdominal wall, the vagina, the rectum, the bladder, or even the stomach; and, if there be more than one fistulous opening, we may have portions successively or simultaneously discharged through two or more of the channels which have been enumerated. While the discharge of débris is going on, the inflammatory action in the interior of the cyst continues, and is probably aggravated by the admission either of the external air, or of the contents of the hollow viscera into which the opening takes place. Irritative fever of a severe type is thus often set up, and to this, those women who have been so fortunate as to escape the dangers already specified may succumb.

In some instances, the course and termination of extra-uterine pregnancy is very different to what has been detailed. The pressure of the tumor may be productive of such annoyance and pain, or may interfere so seriously with the functions of neighboring organs, that the woman sinks and dies without any rupture having occurred; or even, in so far as can be ascertained, without the death of the fœtus having preceded that of the mother. Or, as in another class of recorded cases, the child may die before rupture of the membranes has occurred, a result which we must look upon as favorable in the progress of these cases. For the first result of this is the arrestment of placental circulation, the dwindling of the enlarged vessels on the mother's side, and the consequent abatement in the risk from hemorrhage to which the woman is subjected. Under such exceptional circumstances, it is quite possible that no rupture of the original sac may occur. The fœtus will then be retained without the occurrence either of hemorrhage or peritoneal inflammation, but ultimately its remains will most likely be extruded by a similar process, and through the same channels as in the cases above mentioned. In some remarkable instances, the irritation caused by the presence of a dead fœtus has been so inconsiderable as to permit of its residence for many years within the abdominal cavity, without causing any alarming symptom. It is probably in such cases that the putrefactive process undergoes the peculiar modifications which are manifested either by a withering or mummifaction of the fœtus, or by a change which seems to be closely allied to *adipocere*. In many of the recorded cases in which the fœtus has been retained for an unusually long period, the sac would appear to have become the seat of calcareous deposit, which, by thickening and strengthening its walls, may be supposed at once to protect the fœtus from external violence,—which might induce inflammatory action,—and, at the same time, to protect the external parts, by rendering its rupture practically all but impossible. Burns mentions a case in which he had known the fœtus retained for twenty years, and there have been instances in which it has been retained for thirty, forty, or fifty years. Women, in some of these cases, have repeatedly become pregnant, and have been delivered of healthy children at the full time without disturbing the retained ovum.

In regard to the Treatment of extra-uterine pregnancy, much must in every case depend on the stage of development and the other circumstances of the case. In so far as the early weeks are concerned, it must be obvious that, accurate diagnosis being impossible, treatment can only be palliative, or directed against symptoms, the import of which we can only guess at. But even to suppose an exceptional case in hich all diagnostic difficulties were removed, and the existence of an xtra-uterine pregnancy revealed to us in a manner which excluded the ossibility of doubt, our attempts at treatment would be confined ithin very narrow limits, and would consist of the most simple ossible measures. If the sac were lodged in the pelvis, interference would very probably take place with the functions of the bladder and rectum, requiring close attention to the state of the bowels, and perhaps frequent mechanical aid for the relief of the bladder. The attacks of pain, which are of such frequent occurrence in all the forms, will be most certainly and satisfactorily removed by anodyne applications, and by opiate suppositories or enemata, strict rest in the recumbent posture being at the same time enjoined, with careful attention to the digestive and other functions. It has been suggested by Cazeaux that, even at this early period, attempts should be made, by bleeding to syncope, or by electric shocks passed through the abdomen, to destroy the life of the fœtus. Were this practicable, it would be sound treatment, in view of the probabilities of the case, to cut short the existence of the fœtus; but we apprehend that the result looked for could not be counted upon, while the treatment adopted might otherwise be productive of disastrous results. It has also been recommended to perforate the sac by trocar from the vagina, should this be practicable—a step to which Scanzoni lends his powerful advocacy.

When the period of expulsive effort arrives, it comes to be a question whether in any case we may interfere with a view to the relief of the patient by immediate delivery. The cases, doubtless, in which operative interference may be resorted to, with the greatest prospect of success, are those in which the fœtus is felt through the vagina, and the nature of the case is distinctly made out; and an additional argument in favor of operation will doubtless be afforded by proof of the life of the child. Besides, there is always the chance that the case may be one of those which have been described as *subperitoneo pelvic.* The operation, if resolved upon, consists in an incision through the vaginal walls, and the removal, by forceps or otherwise, of the fœtus; and, if practicable, of the placenta and other parts. By having recourse to this procedure, the lives of infants have been, in a considerable number of instances, preserved; but, as a general rule, the mother has succumbed.

If the pregnancy has reached the eighth month, and the life of the fœtus is indicated by the usual signs; and if the sac can be reached only through the abdominal walls, it is, of course, possible to anticipate rupture, and to extract, by gastrotomy and incision of the sac, a living fœtus. To this operation the name of Laparotomy has been given, and to its performance few obstacles or difficulties would seem to arise. But if we balance the chance of the child's life against what is almost the certainty of the mother's death—which, even under the most favorable conditions, must be the state of the case—we are constrained to pronounce, under such circumstances, emphatically against the operation. The great and special danger which attends its performance is the removal of the placenta, attached, as it probably is, to an undulating and irregular surface. This interposes, in the first place, considerable mechanical difficulty in the removal of the organ; and, in the second, makes it certain that, if we do remove it, we shall have fearful hemorrhage from the gaping vessels, for the closure of which there is no provision analogous to the disposition of the muscular fibres of the gravid uterus. It is otherwise, however, in cases where a living mature child has escaped, by rupture of the sac, into the abdominal cavity, for here the analogy is complete between the case in question and one in which a living child has similarly escaped through a uterine rupture; for, by the operation in these circumstances, the risk to the mother will be little aggravated, while the life of the child may almost certainly be saved.

In the case of a woman who has carried, for one or more years, an extra-uterine fœtus, which causes her great suffering, or which is obviously undermining her general health, the question of operation may also suggest itself, although in a different form. The rule which must here guide us is, in addition to the state of her health, the possibility of reaching the tumor from the vagina; for, unless we were convinced of the existence of adhesions to the anterior or lateral abdominal walls, an operation in this direction would, we conceive, under no circumstances be warranted.

The duty of the surgeon will, however, in most cases, be confined to carefully watching and cautiously assisting in the separation of the fœtal débris. Should one or more fistulous openings exist in the abdominal walls, the vagina, the perineum, or the rectum, the nature and extent of the cavity of the sac may be carefully explored through them. By the aid of sponge-tents, the apertures may be safely distended, and any loose portion removed; care being always taken not to drag rudely such fragments as may be adherent to the walls of the sac, as by doing so the sac might be ruptured, and peritonitis ensue. If the communication has taken place in the direction of the bladder, it may be necessary to remove them by one of the operations for lithotomy; or by dilatation of the urethra, as was done by Professor G. H. B. McLeod in a case which he communicated, many years ago, to the Medico-Chirurgical Society of Glasgow. While the separation of the remains of the fœtus is thus promoted, in any way which experience may suggest to us as consistent with safety, the general health of the woman must be carefully attended to, her strength being sustained by nourishing food and suitable stimulants, while any tendency to hectic or irritative fever must receive its appropriate treatment.

CHAPTER XII.

ABNORMAL DEVELOPMENT.

MOLAR PREGNANCY—FALSE MOLES: FROM VAGINA: MEMBRANOUS DYSMENORRHŒA: FIBROUS AND HEMORRHAGIC CASTS OF UTERUS—TRUE MOLES: FLESHY MOLES: HYDATIDIFORM MOLES—THEIR PATHOLOGY, DIAGNOSIS, AND TREATMENT—DISEASES OF THE PLACENTA, AND THEIR EFFECTS—MISSED LABOR—DISEASES OF THE FŒTUS—INTRA-UTERINE FRACTURES AND AMPUTATIONS: EFFORTS AT REPRODUCTION—MONSTERS.

THERE are, in addition to the peculiarities of development already noticed, certain others which deserve special notice in a systematic treatise, but which, nevertheless, are not unfrequently passed over as of no moment. There is every reason to suppose that these peculiarities have their origin, in a large proportion of instances, in actual disease of the ovum; but whether this is or is not the primary cause of the affection in question, no doubt can, in the present state of pathological knowledge, be admitted as to the frequent coincidence of disease or degeneration of the ovum, either with arrest of development or with the transference of developmental energy to structures which are merely subsidiary. The result of this is the occasional expulsion from the uterus of substances, the nature of which it is not always easy to determine, and the origin and pathology of which have often been misunderstood. These substances are generally termed Moles.

It must be made clear, however, from the outset, that all solid matters discharged from the uterus are not moles, properly so called. In other words, all such discharges are not the result of impregnation—a fact which is of obvious medico-legal importance, and which imposes upon us the necessity of drawing a careful distinction between "*true*" and "*false*" moles. The matters which are discharged from the virgin, or which are independent of impregnation, and which might be mistaken for the result of conception, form but few varieties, and constitute what are termed, with questionable propriety, False Moles. Under this designation may be included bodies, which are composed mainly of the squamous epithelium of the vagina, thrown off in the form of flakes, or tubular casts; and, which may either be expelled singly, or form, by their union, masses of greater or less bulk, but seldom of any considerable size. A careful examination of these by the microscope, or even by the eye, will generally obviate the possibility of error; but, as regards the following, the unwary may easily be misled. It is a fact familiar to every physician, that the most obstinate and intractable form of painful menstruation, or Dysmenorrhœa, is the membranous variety, in which the mucous membrane of the uterus is shed at each catamenial period, either in shreds of various size, or in the form of a single mass, forming a complete cast of the uterine cavity. In some rare instances this occurs also independently of menstrual disorder. It may readily be conceived that in such a case, accompanied, as it generally is, with hemorrhage and sustained expulsive effort, a suspicion of pregnancy and early abortion might arise in the mind—the membrane in question being mistaken for the decidua, from which the embryo has escaped unobserved. In such a case, however, the true nature of the substance discharged may be disclosed by remembering that such an occurrence is not unusual at a menstrual period, and by observing that all the usual and familiar signs of pregnancy are absent. It is, moreover, much less substantial in its texture, and more easily torn than the decidua, which has, under such circumstances, according to Montgomery, "a soft, rich, pulpy appearance, deep vascular color, and numerous well-developed utricular follicles or crypts, and foramina for the reception of the nutrient vessels from the uterus, which are always so distinctly observable. In one point, however, the dysmenorrhœal membrane resembles the decidua—having its inner surface smooth and the outer unequal; but it is of a ragged, shreddy appearance, unlike that of the healthy uterine decidua, and is, moreover, entirely destitute of the little cotyledonous sacculi described as an essential character in the latter structure." No trace of anything analogous to the transparent membranes of the ovum is to be discerned within it, nor does it contain a reflected layer, forming an inner pouch. When perfect it presents three openings—one for each Fallopian tube, and one at the points of connection with the cervix uteri.

A third variety of false mole has been described as occurring under certain conditions of functional derangement of the uterus, more especially when this is accompanied with some form of inflammatory action. In it, the substances expelled are of a fibrinous appearance externally, of a firm consistence, and varying greatly in size, but frequently presenting the form of a cast of the uterine cavity. Most frequently these are composed of blood-clots, which have become condensed and altered in appearance by their decolorization externally. In certain cases, they appear to be composed partly of clot and partly of lymph; while in others, which have been carefully observed, it would appear that a membranous cast has been surrounded by an outer layer of condensed coagulation.[1]

The True Moles differ from the above essentially in this, that they are in every instance the result of conception, in which, generally, the embryo has been blighted, and yet development of the membranes has progressed with abnormal activity. In the investigation of these cases, it is of importance to remember what Smellie tells us. "Should the embryo die," he says, "(suppose in the first or second month), some days before the ovum is discharged, it will sometimes be entirely dissolved, so that when the secundines are delivered there is nothing more to be seen. In the first month, the embryo is so small and tender that the dissolution will be performed in twelve hours; in the second month, two, three, or four days will suffice for this purpose." If this is the case when the ovum is expelled shortly after the death of the embryo, it need not astonish us that when it is retained for a considerable period all trace of embryo has disappeared, while the membranes are so degenerated or metamorphosed that it is only with difficulty that the true nature of the case can be recognized.

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[1] These formations are fully described and graphically depicted by Dr. A. B. Granville, in his admirable monograph on Abortion and the Diseases of Menstruation.

Of the highest interest and importance in reference to this subject, and more especially to the question of etiology, are the hemorrhagic discharges of which the ovum is the seat. In addition to the direct effect, which must spring from the sudden abstraction of blood either from the fœtal or maternal vessels connected with the ovum, the blood which flows from the ruptured vessels very frequently exercises a mechanical influence in the separation of contiguous parts, with the most disastrous results. Blood may thus be interposed by the rupture of the utero-decidual vessels, and so cut off the only maternal supply possible for the early embryo. Or, at a later stage, hemorrhage from the utero-placental vessels may so engorge the parenchyma of the placenta, as to cause apoplexy of that organ, an affection which we shall have occasion hereafter to mention. Again, the extravasation may take place between the chorion and the decidua reflexa, or even within the amnion, destroying the embryo and giving rise to abortion. Particular attention has been given by Scanzoni to the various forms of apoplexy of the ovum, a subject which is of interest to us at this stage, as a cause not only of death of the embryo, and of abortion, but also of the formation of true moles, when abortion does not at once ensue. His conclusions as to the progress and termination of the hemorrhage are as follows:

"1. If the flow of blood is simply from the utero-placental or utero-decidual vessels, and the quantity is inconsiderable, this does not suffice to separate the ovum in the greater part of its circumference, or by mechanical pressure to arrest its further development; so that blood effused between the uterine walls and the decidua, or even between the two layers of the latter, may be either completely or, at least, partially reabsorbed, and the pregnancy may reach its normal termination.

"2. But if the quantity of the effused blood is considerable, the ovum is separated from the uterine walls either entirely or to a great extent, and is compressed by the voluminous coagulum, and more or less flattened: such compression actually causes bursting of the membranes (of which Dubois narrates a case), when abortion is the usual result.

"3. The same is the result when the fœtus dies through rupture of its own vessels and the placental hemorrhage thus induced. Here also the abortive ovum is expelled, the rapidity with which the abortion occurs depending especially on the occurrence of simultaneous uterine hemorrhage.

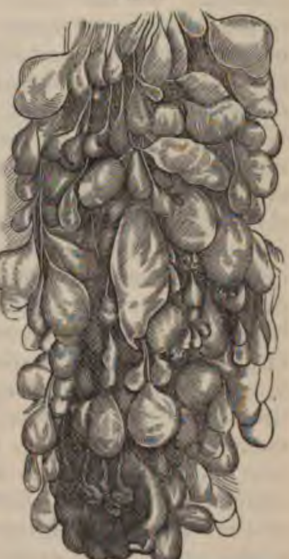
"4. The ovum may, as is much more rarely the case, remain with the dead fœtus for a considerable time in the uterine cavity; the coagulum undergoes certain changes, which are also observable in extravasation in other parts of the body, and so gives occasion for the origin of the formation known under the name of Fleshmole."

The *Fleshy Mole* (Mola Carnosa) is probably formed in part from coagula and in part from the membranes of the ovum, which undergo a species of degeneration by some such series of changes as the following: The effused blood becomes in the first instance decolorized by rupture of the blood-corpuscles and absorption of their coloring matter. This decoloration takes place from the centre towards the circumference. The fibrin, as Scanzoni supposes, becomes transformed into cellular tissue, by means of which communication is established between the external lining of the ovum on the one hand, and the inner surface of the uterine wall on the other,—so that the further development of the structures thus in apposition is rendered possible. We may assume that in these cases complete separation of the ovum cannot have taken place, otherwise the death of the whole structures of the ovum would have rendered its expulsion inevitable. And, as the connection between the uterus and the ovum is most firm at that part where the placenta has either formed or is about to form, the probability is that the vascular supply sent to the ovum through this channel is never entirely cut off. On the establishment of new and more extensive adhesions, the blood supply is at once augmented, and the membranes and effused coagula become intimately bound together into a mass, through which vessels freely run, and which becomes hypertrophied to a very considerable extent. It would appear that, at least under certain circumstances, the chief seat of the carneous degeneration is the decidua vera; for, it is certain that in many of the cases which have been most carefully examined, the structure of the chorion has been distinctly recognized by its villi, although the membrane itself had undergone some considerable thickening. The villi in these cases have been found to consist of molecular masses and fat-cells. The amnion undergoes little change, and may be found adhering to the inner surface of the chorion, and containing within its cavity a certain quantity of bloody fluid, in which will be found what remains of the embryo. The rudiments of the embryo are, however, frequently very indistinct, unless the pregnancy should chance to have been more advanced than usual; and, indeed, difficulty will frequently be experienced in tracing even the remains of the cord, although the chorion and amnion may be tolerably distinct. The nature of the case will nevertheless usually be recognized on a careful examination, by the discovery of the villi of the chorion; and Scanzoni asserts further that in the cases examined by him he has never failed to discover the enlarged villi by the agency of which the placenta was already going through the earliest stage of its formation. While in all these cases the diseased membranes go on increasing in bulk, they are of course rendered quite unfit for the discharge of their primary functions, so that the contained embryo, if its death has not preceded the degeneration, must speedily succumb. "When the growth of the ovum," says Rigby, "proceeds after the destruction of the embryo, it increases very rapidly in size, much more so than would be the case in natural pregnancy, so that the uterus, when filled with a mole of this sort, is as large at the third month as it would be in pregnancy at the fifth." As the development of the mole goes on, it increases in density as well as bulk, and the growth may continue for three or four months, until its presence within the uterus awakens expulsive efforts, when it is speedily expelled, presenting the characteristics just detailed.

Cases occasionally occur in which fatty degeneration is the most conspicuous characteristic of a mole; but this we may merely mention as a variety of the fleshy form; and the same remark may be made in regard to what has been described by the German authors as "*Steinmole*," a variety which seems to attend a retention of the mole within the uterus for an unusually long period; and which implies, as its name indicates, a calcareous degeneration of what was, in all probability, originally an ordinary fleshy mole. With reference to such cases, it may, however, be remarked, that such calcareous masses are to be cautiously received as evidence of mole pregnancy, unless the characteristics of the latter are clearly manifested. For we know that fibroid tumors of the uterus are also subject, although rarely, to a similar degeneration, and it is quite within the bounds of possibility that an error of some magnitude might here be committed, seeing that these concretions are sometimes spontaneously separated from the uterus, and discharged through the vagina.

The Hydatidiform Mole.—The bodies which form the distinguishing feature of these moles were long supposed to be true hydatids, formed in and discharged from the uterus. More careful examination showed, however, that they were not, like true hydatids, closed sacs within one another, but that the vesicles were arranged in a manner quite different from this, each saccule growing from another, in regard to which it is either sessile, or connected by a pedicle of varying length. In this manner cyst grows out of cyst, and the pedicles do not unite them with principal stems, but with each other, so that, as Mettenheimer and Barnes have shown, it is incorrect to compare them, with Gooch, to currants, or, with Cruveilhier, to a bunch of grapes. The arrangement is very well shown in the annexed representation of a mass of these bodies which had been expelled from the uterus. The vesicles vary considerably in size, from a walnut downwards, according to the development which they have attained, or the distance at which they are situated from the parent cyst, from which they originally spring. Not unfrequently, when they escape unexpectedly, they are brought under the notice of the practitioner floating in a basin of water, and discolored with blood; and under these circumstances the graphic description of Gooch is singularly applicable, for they then resemble very closely a mass of "white currants floating in red currant-juice."

Fig. 93.



Hydatidiform degeneration of ovum.

Although the exact mode in which the vesicles constituting the hydatidiform mole are formed is not yet clearly fixed to the satisfaction of all, there is one point in which all modern authorities are agreed, viz., that they spring from the villi of the chorion. It is also admitted that in this, as in the fleshy mole, we have no new formation, but simply an alteration and degeneration of previously existing structures. But when we come to consider the pathological process by which this alteration is effected, we find that considerable differences of opinion exist. The views on this subject originally propounded by Mettenheimer in 1850, in "Müller's Archiv," and which have been indorsed in this country by Paget and Barnes, are those which are generally entertained. The villi of the chorion, as has been pointed out by modern physiologists, grow normally by a process of gemmation, bud springing from bud in successive stages of growth. Under the influence of perverted development, these buds, or the elementary cells of which each villus is composed, take on a new action, and become transformed into vesicles, which vary in size, and to which attaches the power of repeating the process of chorion development, still in a perverted sense, until the so-called hydatidiform mass is formed. Gierse is of opinion that the change consists in hypertrophy of the normal structures found in the chorion villi, with secondary œdema; and Dr. Graily Hewitt urges that the vesicular transformation is a consequence and not a cause of the death of the embryo, and that it is therefore nothing more than a degeneration of structures arrested in their development. We fail to see, however, that the death of the embryo, prior to the formation of the cysts, is in any way incompatible with the theory of Mettenheimer; indeed, we cannot but think it extremely probable that in this, as in the case of fleshy moles, it is the developmental force diverted by the death of the embryo into an unwonted channel which is the great cause of the activity of the degenerative process. And, moreover, this is all the more likely to take the form of cystic degeneration on account of the peculiar anatomical conditions under which the villi of the chorion, and more especially those of the placenta, are produced. The period within which hydatidiform degeneration may originate does not probably extend beyond the tenth week, for it is during that period that the activity is greatest in the growth and multiplication of the villi; and, at a later stage, when bloodvessels have largely occupied the bulk of the villi, it would appear that they are no longer capable of undergoing that form of degeneration. A certain dropsical condition, or secondary œdema, as Gierse describes it, of the membranes, is probably an essential part of the degeneration in question, and may serve to account for the constant supply of the fluid which fills the sacs. Although the special activity in the development of the villi which ultimately would have formed the perfect placenta, might naturally be expected to attract thither the morbid action, experience has shown that this is not invariably the case.

An important question has arisen as to whether a portion of placenta, retained at the full term, can take on hydatidiform change. This has been answered in the affirmative; among others, by Montgomery and Ramsbotham. All recent writers, however, dispute this conclusion.

In the majority of cases, an examination conducted with every care shortly after expulsion fails to detect any trace whatever of the embryo. In some instances, however, a fœtus has been discovered. The reason of this lies very obviously in the fact that, here, growth is limited to the chorion and the degenerated villi, and that the uterus is filled with an enormous mass of cysts which have sprung from this source, so that the cavity of the amnion and its contents are almost inevitably obliterated. The destruction of the embryo is, for this reason, much more complete than in the fleshy variety of mole.

In regard to the symptoms of this form of mole, they are at first identical with the ordinary signs which are supposed, in the first three months, to indicate pregnancy. The usual symptoms, and more especially those which have their seat in the mamma, then become indistinct and perplexing. The patient is ill at ease, her appetite and digestion become impaired, and her feelings are quite different to those which attended former pregnancies. So soon as the degenerative process has been thoroughly established, the increase in the bulk of the uterus goes on with very unusual rapidity, and it has been noticed to expand irregularly, and more in a lateral than in the usual upward direction. When the period arrives at which the conclusive proofs of pregnancy should, under ordinary circumstances, be distinctly manifested, the absence of fœtal pulsation and ballottement will arouse suspicion as to the nature of the case. But, at a period even earlier than this, watery and sanguineous discharges, mixed or separately, may occur, the former being due to the bursting of distended vesicles, which are doubtless submitted to considerable pressure. It occasionally happens that, along with these discharges, a few vesicles only, or a larger proportion of the mass, escape, which at once reveals the nature of the case. There is, in addition, another symptom to which we would call special attention, and which we have found of the highest importance in practice in the diagnosis of this affection. This consists in a peculiar doughy, boggy feeling, which is revealed on palpation, and which we take to be in the highest degree characteristic, more especially if we take along with it the absence of that irregular hardness which indicates the prominences of the fœtus. The term "dense" which we find generally used to describe the feeling of the uterus in this condition, is, we apprehend, singularly inappropriate. "Tense," again, would represent correctly enough the effect of the rapid distension, but the sensation yielded by palpation, which we have had the opportunity of thoroughly testing in several cases, is, we are persuaded, more correctly described above, than by either of the terms specified.

The existence of moles of this nature is seldom prolonged beyond the sixth month, when repeated hemorrhage, and overdistension of the uterus, entailing probably a partial separation of the placenta, will usually have excited uterine contraction. The usual effect of these contractions, when once thoroughly aroused, is to effect the complete separation of the entire ovum, which insures the safety of the woman by the arrest of the hemorrhage. It would seem, however, that under certain special circumstances, fortunately of rare occurrence, the connection between the uterus and the ovum is so firm that a portion only of the fruit of conception is expelled. "In such cases," says Scanzoni, "portions of the ovum remain behind in the uterine cavity for a considerable time, on account of their firmer connection with the inner wall of the uterus. These may give rise to profuse and long-continued floodings, as we have seen in one of our cases occurring in the gynæcological clinic at Prague, where an exhausting hemorrhage, which had continued for some months after the expulsion of a vesicular mole, was first arrested on the removal by the hand of the remainder of the ovum, which had remained behind in the cavity of the uterus."

What is, however, of more frequent occurrence when the whole of the ovum is not at once expelled, is, that the case turns out to be one of twin pregnancy, in which the membranes of one embryo only have become the seat of the degeneration in question. Doubtless, under such circumstances, the uterus, after expelling a large hydatidiform mass, will not cease in its efforts until the whole of its contents have been expelled; but a certain number of cases have been recorded, in which, after such an event, a fully developed child has been expelled after an interval of a few months, a fact which is only reconcilable with the idea above expressed. This is said by Montgomery to have occurred at the birth of the celebrated anatomist Beclard. The most recent observations on this subject seem to indicate that examples of this nature are by no means of unfrequent occurrence, which obviously shows that we should exercise caution in the treatment of such cases, lest we destroy the living germ while removing the dead.

The treatment of all such cases will of course depend on the urgency of the symptoms. So long as they are moderate in severity, and are not such as to call for immediate action, our course of treatment must be purely expectant, more especially as there will almost always be an element of doubt in the diagnosis. But, so soon as profuse watery and hemorrhagic discharges shall have reduced the strength of the woman to a certain extent,—of which we must judge on general principles,—we must not delay until interference is a mere *dernier ressort*, but act promptly, and in the manner most likely to empty the uterus speedily of its contents. In several cases of hydatids, we have found the ergot of rye act quite satisfactorily, and effect expulsion without difficulty; as indeed, it usually does when the uterus has reached a certain degree of distension. We recommend, therefore, that in the first instance, this drug should be employed, but if, as often happens, it fails to excite uterine effect, we must then resort to other means. A sound or catheter has been introduced into the womb, and successfully used so as to break up the mass, and separate it as far as possible from its uterine attachment; but we should think it a safer as well as a more satisfactory method, to dilute the os and cervix by means of Barnes's bags or other similar appliances, so as to introduce the hand, and remove at once the whole mass. The dilatation of the os and cervix by means of sponge-tents would also have the effect of exciting the uterus to contraction, and would have the further advantage of checking hemorrhage. Galvanism has also been recommended, the object, of course, in each and all of these modes of procedure, being to empty the uterus safely as well as quickly. Nothing special need be said in reference to the treatment of the fleshy mole, as in that case the diagnosis is much more difficult. Although the unexpected arrest of development, and the general constitutional disturbance, with the cessation of such of the signs of pregnancy as may previously have been present, may indicate the probability of this affection, it is seldom that its nature is recognized until the carneous mass, with the blighted ovum, has been expelled.

There is yet another group of cases in which the pathological phenomena are also to be found in a portion of the ovum, but which occur at a later period of pregnancy than those which we have just been considering. In these instances, development goes on uninterruptedly until the placenta has been fully formed; and it is to diseases of that organ that the death of the fœtus is then due. Among the affections of the placenta which may have this result, is Apoplexy of the Placenta, in which blood is effused, by rupture of vessels, into the parenchyma of the organ, exactly as takes place in the lung, and with a similar result as regards the respiratory function. Another affection which, as we have already seen, is apt to attack the tissue of the fleshy mole, is Fatty Degeneration. Recent researches show that, at a more advanced period of gestation, the same pathological change is apt to invade the tissue of the placenta, and so to alter its structure as to interfere seriously with, and ultimately to arrest, the development of the embryo. The cause of this fatty degeneration has been very carefully investigated by Barnes, Priestley, and others; and the conclusion at which they seem to have arrived is, that the fatty molecules are the result of a low form of placentitis,—being either thrown out, primarily, as inflammatory exudations, or formed, secondarily, of inflammatory products, which subsequently degenerate into fat particles. Placentitis is another affection which may cause intra-uterine death,—the inflammatory process, in these instances, attacking the organ, and in extreme cases leading to hepatization, induration, abscess, and the other terminations of the inflammatory state. The morbid action is generally confined to a limited portion of the organ, or to a few lobules, and extends from the maternal towards the fœtal surface of the placenta. There is reason to believe that morbid adhesion of the placenta may have its origin in this; and, in connection with it, hypertrophy of the decidua serotina has not unfrequently been observed. General œdema, or dropsy of the placenta, is another affection of the organ which has been carefully observed by Meckel and Gierse. The appearances are here altered to those which are characteristic of œdema in all soft tissues; swellings, paleness in color, and serous infiltration, being the leading features which an examination of the tissue reveals. "This must not," as Simpson well remarks, "be confounded with the white, blanched, and merely anæmic state of the placenta, often observable in cases where the child has died of peritonitis, or other fœtal diseases, and been retained in utero for some time subsequently; and it is pathologically very different also from the stearoid or fatty degeneration." Hypertrophy of the placenta, cartilaginous and calcareous degeneration, ramollissement, and atrophy, are all affections which have been specially observed. In many of the affections above enumerated, there seems to be a tendency to return in subsequent pregnancies; and it may be held as an established fact, that such has been the case in many of those instances of repeated abortion which cause so much disappointment to the mother. Under the influence of these degenerations, the nutrition of the placenta may, for a time, go on uninterruptedly. Soon, however, its function is interfered with, and the safety of the fœtus becomes compromised. The general rule, in such circumstances, undoubtedly is, that the uterus is excited by the foreign body to active contraction, and abortion is the result. But, in a certain number of instances, the diseased vitality of the placenta is maintained, while the embryo becomes shrivelled and attenuated to an extraordinary degree,—under which conditions it may be retained until the full term of gestation is reached, and then discharged. This latter result is more likely to occur in twin than in single pregnancies,—the placenta of the one fœtus being diseased, and the other remaining healthy; and it is probably under such circumstances that, with a fully-formed child, a shrunken fœtus is sometimes expelled—giving rise, erroneously, to a suspicion of superfœtation. The dead fœtus, in these instances, is generally flattened by the pressure which is exercised upon it by the other in the course of its development.

An extremely rare and curious phenomenon has been occasionally observed, in which, the fœtus remaining in utero, labor does not come on at the usual time; and the remains of the fœtus may be retained for a considerable period, or discharged piecemeal by the vagina without, for a time, at least, seriously affecting the health of the mother. This has been called *Missed Labor*, and is alluded to by Dr. Tyler Smith in his admirable Manual, in which he gives the history and illustration of a case which occurred in the experience of Dr. Oldham.

The Umbilical Cord may also, like the placenta, be the seat of certain anomalies, or morbid affections, which may cause the untimely death of the fœtus. Under the former class, may be ranged cases of true knots on the cord, and twisting of it round various parts of the child, which may possibly be attended with fatal results; and, under the latter, may be mentioned inflammation of the cord, or of any of its parts, and cystic degeneration, which was first described by Ruysch, and has been mentioned by subsequent writers, although it is probably of very rare occurrence.

Diseases of the Fœtus.—Having now considered the chief morbid conditions which affect the other parts of the ovum, including the placenta, we may at this place advert, with propriety, to the various diseases to which the fœtus itself is liable. With few exceptions, the fœtus may be said to be subject to the same diseases as are observed after birth. Among the most frequent are the affections of the nervous system which give rise to hemorrhages; or which consist primarily in inflammatory affections, from which spring secondary results, and are attended with serious results to the mother as well as to the child. Hemorrhages into the substance of the fœtal brain are very rare, but it is not so much so in regard to discharges which take place behind the membranes or on the surface of the brain. These affections when observed, and when unconnected with obstructed delivery, have usually been found associated with placental apoplexy or obstruction of the cord. Of all the results of inflammatory action in this situation, the most familiar is chronic hydrocephalus, in which the quantity of serum effused within the cranium is often so great as not only to cause a certain amount of atrophy of the encephalon, but also an increase in the size of the head, so considerable as to form a serious obstacle to delivery. Convulsions may attack the fœtus while it is yet in the womb, and cases have been observed in which convulsions on the part of the mother were communicated to the child. The probable cause of these, in most instances, is arrest of the circulation, which causes the fœtus to die of apnœa,—of which convulsive action is a frequent symptom. Although the lungs are as yet of very small size, it would appear that they are occasionally, though very rarely, the seat of inflammation; but pleurisy and tuberculosis are of much more frequent occurrence than pneumonia. Acute and chronic peritonitis, whether general or partial in extent, is met with much oftener than the above. This affection may be accompanied with effusions, which are identical in appearance and general characteristics with those which are so frequently observed after birth; and, according to the type of the inflammatory action, they may take the form, either of coagulable lymph, by means of which the viscera may be glued together, or of a fluid effusion, the quantity of which may become enormous, and may cause the death of the fœtus either before or after birth, or may even render delivery difficult. It would appear from certain researches made by Simpson in reference to this affection, that it is not unfrequently associated with syphilitic disease of the mother. Diseases of the liver and of the spleen, many of them associated with the same constitutional disorder, have also been frequently observed; and, more rarely, affections of the alimentary canal, with which may be classed cases of Ascarides and Tænia, these entozoa having been repeatedly found in the intestines of the unborn. Congestion, cystic degeneration, and other affections of the kidney, as well as various affections of the ureter have occasionally been noticed; and the same may be said with reference to cardiac diseases, examples of which, including peri- and endocarditis, have also been noted. Various diseases of the skin are observed in children born either prematurely or at the full time, including the characteristic eruption of certain febrile diseases, such as variola, which may be contracted from the mother within the uterus; or, what is much more wonderful, which may be communicated through the mother to the child, she herself remaining unaffected. Erythema, pemphigus, and other forms of skin disease, are very frequently to be received as evidence of the existence of syphilitic disease, in one parent or in both.

Fracture of the bones of the fœtus is an affection which is usually the result of violence from without; but a sufficient number of cases have been observed to establish the fact that, independently of any such accident, intra-uterine fracture may occur. Some of the recorded instances of this are of the most extraordinary nature. Chaussier, for example, tells us of one case in which there were forty-three, and another in which there were no fewer than one hundred and thirteen fractures of the bones of the fœtus, facts which it is difficult to conceive, unless under the supposition that extensive disease of the bones existed. But a more extraordinary phenomenon still is the occurrence within the womb of what has been described as spontaneous amputation. Haller, and many physiologists after him, supposed that these were cases of simple arrested development, but that this cannot be the case in every instance is proved by the discovery within the uterus of the missing part. The fact of this spontaneous amputation having, at a more advanced period, been clearly established by irrefragable evidence, the question which next presented itself for solution was the manner in which such a separation within the uterus could by any possibility take place. To this, the reply given by Chaussier, Billard, and other writers of that period, was that the only manner in which it could be accounted for was to suppose that the parts separated had been the seat of gangrene, and that spontaneous amputation had taken place at the line of demarcation between the living and dead tissue. The discovery in several cases of the amputated part, which had not undergone any decomposition, soon proved that this theory was quite erroneous, and it is to Montgomery that we owe what is now generally believed to be the correct explanation of what was long a pathological problem. Montgomery's view, which has, since he wrote, received the most ample confirmation, was that the intra-uterine section was effected, either by constriction exercised by the cord, or by special bands consisting originally of organized lymph, such as is usually elaborated under the influence of inflammatory action. These bands or threads having become fixed round a limb, their compressive power becomes daily augmented, on the one hand, by their own contractions, and, on the other, by the growth of the body within their grasp. In the majority of cases, the complete separation of the limb is not effected, and it is only partially divided. But, if the processes of contraction and growth continue, the supply of blood to the distal part of the limb is first diminished and then cut off; and, ultimately, the nutrition of the bone being similarly interfered with, it becomes brittle, and probably breaks off short at the point of constriction. A most interesting observation, which we owe to Simpson, in connection with this subject, is the occurrence in these instances of an attempt on the part of nature to remedy the deficiency by a process of reproduction which is familiar low in the animal scale, but of which, as we ascend, nature avails herself less and less. When, in a case of this kind, as he shows by reference to a considerable number of cases, separation in utero occurs, a stump is found which offers certain peculiarities in appearance. "Two points of the skin, or rather of the subcutaneous tissue, are found adherent to the ends of the ulna and radius, and present a depressed or umbilicated form, particularly when the forearm is flexed and moved, and the fissures of the skin run in converging lines to these two points as centres. Midway, and a little in front of these two points, the rudiment of the regenerated extremity is situated in the form of a raised cutaneous fold, or fleshy mass, or tubercle, and having on its surface one, two, or more smaller projections or nodules, furnished with minute nails." In illustration of this, the appended engraving is given, representing the stump of the left[1] forearm of a fœtus of the seventh month, preserved in the Obstetric

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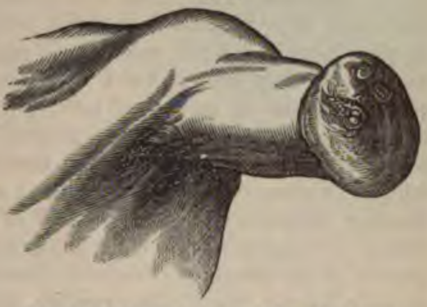
[1] It is somewhat remarkable that this accident generally occurs on the *left* side.

Museum of the University of Edinburgh. There are five small rudimentary fingers tipped with minute nails, in the usual position on the end of the stump.

FIG. 94.



Intra-uterine amputation and attempted reproduction.

Deviations from the ordinary process of development frequently give rise to results which constitute Monstrosities. The subject of monsters, however, although it might fairly enough be discussed here, is one of such magnitude that we must needs pass it by, as one of which it is impossible to give even the briefest notice in a work such as this. Those who would pursue the subject may refer to the magnificent *Traité de Tératologie* by Geoffroy Saint-Hilaire, and to other works where the subject is fully and exhaustively treated. The Anencephalic, Cyclocephalic, and other varieties, which consist in the absence of portions of the cranium and subjacent parts, are interesting chiefly from a purely practical point of view, as being likely to puzzle any one who, on making a digital examination during labor, might chance to touch such a formation. While the double monsters are, as we shall see, interesting in their practical bearing, as being certain to be attended with difficult labor, the whole subject of monstrosities and malformations is, however, here quite beyond our grasp.

CHAPTER XIII.

DISEASES OF PREGNANCY.

SOME DISORDERS MERE EXAGGERATIONS OF CERTAIN SIGNS OF PREGNANCY. I. DISORDERS OF THE DIGESTIVE FUNCTIONS: EXCESSIVE VOMITING: TREATMENT OF: QUESTION OF INDUCTION OF PREMATURE LABOR IN—ANOREXIA—GASTRODYNIA—PYROSIS—CONSTIPATION—DIARRHŒA. II. DISORDERS OF RESPIRATION: DYSPNŒA: COUGH. III. DISORDERS OF THE CIRCULATION: CONDITION OF THE BLOOD IN PREGNANCY: DIMINUTION OF BLOOD-CORPUSCLES: PROPORTIONAL ALTERATION IN FIBRIN AND ALBUMEN—SUPPOSED RESEMBLANCE OF THE PHENOMENA OF PREGNANCY TO THOSE OF CHLOROSIS—ADMINISTRATION OF IRON IN PREGNANCY—PLETHORA—VARICOSE VEINS—HÆMORRHOIDS—THROMBUS OF THE VAGINA.

MANY of the symptoms which have already been detailed as indicative of pregnancy are such as, under ordinary circumstances, would be regarded as pathological phenomena, and would be classed as Diseases, or at least as Disorders. But, under the special circumstances which attend the pregnant state, which implies the development of a function purely physiological, these symptoms, which are in a great measure the result of sympathetic or reflex irritation, are naturally looked upon as physiological signs, and not as pathological phenomena. So long, at least, as they are confined within moderate limits, it is usual either to treat them by means of mild palliative measures, or to disregard them altogether, provided the general health does not seem to be in any serious degree affected. A very small amount of practical experience suffices to show that great differences exist, consistently with a perfectly healthy pregnancy, in the gravity of the symptoms which are manifested; a woman, in one case, being scarcely exposed, during the whole period of her pregnancy, even to discomfort; while, in another, with an equally happy result, disagreeable symptoms of one kind or another have been wellnigh incessant. The difficulty, therefore, is where to draw the line, and to determine what cases demand treatment, and in what others interference is to be avoided. These remarks apply especially to the abnormal digestive phenomena which so invariably attend pregnancy, and to certain other symptoms which may be referred to the same category. There are, as is well known, many other symptoms, which are exceptionally attendant on gestation, and which, when present, are essentially pathological from the first. The whole subject, therefore, of the diseases of pregnancy, is one to which careful attention should be given; by the student, in the first instance, that he may be able to appreciate the significance of such symptoms as he may observe; and, by the practitioner, that he may be able, in case of need, so to manage a pregnancy with prudence, as to avert such dangers as may be foreseen and avoided. There is good reason to believe that a sound knowledge of the morbid phenomena of pregnancy may enable us not only to avert dangers the nature of which is now well understood, but to discover, in the future, means whereby the dangers and diseases of development may be combated, by agents not yet at our command, and the risks of childbed be thus lessened both to mother and child.

A study, however superficial, of diseases of the womb, or of menstrual derangements, shows clearly that a sympathy, of a very intimate kind, exists between the uterus, and the nervous and digestive systems; a sympathy which a knowledge of the origin and distribution of the par vagum and sympathetic nerves might already have led us to expect. We cannot wonder, then, that, during pregnancy, when the function of the uterus is so exalted, this sympathetic action should also be exaggerated. The symptoms manifested are infinite in their variety, according to the constitution of the individual; but so deceptive and erratic are they in their mode of development, that we can place no dependence on them as a guide to the probable progress of a given case. There are instances, and these by no means of very unfrequent occurrence, in which the constitution is actually improved by the occurrence of pregnancy; and cases are even observed in which the downward course of lingering and wasting disease is arrested by the occurrence of conception, and is held in abeyance during its continuance. There are, on the other hand, extreme cases, in which the life of the woman is actually in danger, not from any acute or organic disease, but from the great functional disturbance which, in these peculiar instances, pregnancy provokes. The time at which such symptoms as merit the name of pathological phenomena manifest themselves varies very considerably. Some have their origin in the early months, and such will usually be found, on careful examination, to be purely sympathetic; while those, on the other hand, which do not call for attention and treatment till towards the end of the term of gestation, will be found, as a rule, to be due to some pressure, or mechanical interference with the functions which are disturbed.

Most modern writers, in considering systematically the disorders of the pregnant state, have adopted either the classification of Désormeaux or some modification of it. Following their example, and although we are aware that the classification is open to objection, we propose to divide the affections in question into the following groups:

1. Disorders of the Digestive Functions.
2. Disorders of Respiration.
3. Disorders of the Circulatory System.
4. Disorders of the Secretions and Excretions.
5. Disorders affecting Locomotion.
6. Disorders affecting the Nervous System.
7. Displacements of the Gravid Uterus.

I. *Disorders of the Digestive Functions.*—Vomiting, or rather "morning sickness" is, as has already been stated, one of the most constant, as it is one of the earliest of the signs of pregnancy. Indeed, it may be said that, owing to the intimate sympathy which has been spoken of as existing between the uterus on the one hand and the stomach on the other, almost all pregnant women are affected with it more or less. Sometimes this symptom manifests itself almost immediately after conception—almost always in the course of a few weeks—and it generally continues till the period of quickening has been reached. So long as the vomiting is moderate, it is usual not to interfere, and, indeed, an impression very generally prevails, to which Puzos and others have given expression, that it is a salutary symptom, and midwives have an aphorism that "a sick pregnancy is a safe one." But in some cases the sickness goes to a very great extent, the woman being constantly nauseated, and the stomach rejecting almost everything, solid or fluid, which it receives. In some of the worst of these cases, it is a matter of constant astonishment how it is possible for the vital powers to be sustained, as everything seems to be ejected almost as soon as it is swallowed. Of course, in all such cases a certain portion of the food must be retained, or the stomach rapidly absorbs a portion before its contents are voided. As a rule the symptom is most violent and most frequently calls for treatment in the case of primiparæ; but it occasionally happens that a woman, who has previously been pregnant without any very marked digestive disorder, may, on a subsequent occasion, undergo the misery of this affection to the fullest extent.

There exists, moreover, a great variety in the amount of pain or discomfort to which the act of vomiting gives rise—some women simply emptying the stomach, without pain or effort, as in the vomiting which is symptomatic of brain disease, while others suffer pain and exhaustion from the excessive retching to an extent which leads us to marvel how it is possible, under such continued spasmodic action, for the uterus to remain quiescent, and to retain its contents. Even in the extreme cases, the emaciation is by no means in proportion to the severity of the symptoms, and the development of the fœtus goes on as steadily as if the system were quite unaffected by any disturbing influence.

In the cases which are most intractable, the matters ejected are often mixed with bile; the breath is fetid, and the patient complains of severe epigastric pain. The latter has been relieved by leeching, and sometimes by the application of a small blister to the epigastrium, which may be dressed with morphia. The experience of all, however, who have tried opium seems to be against the use of opiates, at least by the mouth. Sometimes, quite suddenly, and without any treatment whatever, the symptoms cease, after having attained their maximum of intensity; but in other cases they persist, and, if not relieved, reduce the woman to the last stage of exhaustion, when nature at last interferes for her relief by the occurrence of spontaneous abortion—a fact which has been generally received as an indication of the treatment which we should adopt in extreme cases. There is scarcely any form of rational treatment which has not been tried, with a view to the alleviation of this distressing symptom. We shall only mention here, however, such remedies as have been recommended by the best authorities, or have seemed to us to be the most reliable. Narcotics, as a rule, are worse than useless. When the symptoms are slight, and confined to a simple aggravation of the ordinary morning sickness—under which some women are vastly more impatient than others—the remedies employed should be of the mildest possible nature; and in many cases some bitter infusion, or a cup of strong tea before rising in the morning, has quite a decided effect. In several instances we have known the nausea to be greatly relieved and the vomiting entirely checked by breakfasting in bed, and not rising for some little time afterwards. In some, food is only retained when cold; and in others, nothing will lie on the stomach but what is hot. Ice will sometimes check it, and bismuth, in doses of eight or ten grains, has been said by Cazeaux to have a good effect. It will be obvious from these facts that the management of the diet is an important part of treatment, but one which will often perplex us sadly.

The strictest attention must be paid to the state of the bowels, and marked benefit is often derived, in cases where they are sluggish in their action, from a gentle dose of some such mild laxative as Carlsbad salts, Pulna water, or the phosphate of soda. There is, perhaps, no class of remedies which is attended with such beneficial results as effervescing draughts, among the best of which may be mentioned the granular effervescing citrate of magnesia. On the Continent a favorite remedy is the "potion de Rivière," which is prepared and given in the following manner, so that the effervescence actually occurs within the stomach:

℞. 1. Acid. Citric., gr. xxxvj.
Syr Simp., ℥ j.
Aquæ, ℥ ij. S.

2. Potass. bicarb., gr. xxxvj.
Aquæ, ℥ iij. S.
Sig. A tablespoonful of each to be taken successively.

Calumba and soda is a favorite combination with some; and hydrocyanic acid, or creasote, may be tried, although their usual effect is not to be depended upon. Salicin has also been mentioned; and the salts of cerium have been used and strongly recommended by Simpson, but in so far as our experience goes, with no better effect than the other means which have been mentioned. Should there be much exhaustion of the patient's strength, stimulants must be employed; and indeed, these, when taken in moderate quantities, and in an effervescing form, such as champagne, or brandy and soda-water, seem almost to exercise a specific influence. In some cases pepsin is a very valuable addition to other modes of treatment. Sometimes, when such of the above measures as may have been selected, are totally devoid of effect, we stumble fortunately on some agent which may chance to have the desired effect, even though it be of the simplest possible character. Of such a nature is milk and lime-water, and barley-water; indeed, in reference to the latter, we have seen such striking instances of its efficacy, in which it has been retained by the stomach when all else has been rejected, that we have come to look upon it as among the most valuable agents which we have at command. Lumbar pain is sometimes associated with the vomiting of pregnancy, and it is possible that this may depend upon that slight form of uterine inflammation to which Burns refers as a cause of obstinate vomiting. This affords, at least, a rational explanation of the effect of fomentations, hot baths, and, if the patient be plethoric, of leeches applied to the loins, in arresting the vomiting in this class of cases. A beneficial effect is also derived from the use of belladonna, applied either to the abdomen, as recommended by Bretonneau, or administered in the form of pessaries. In some cases, where the irritability of the stomach seems merely to be increased by food and drink, it will be proper for us to sustain the powers of nature by nutritive enemata; and availing ourselves, further, of the possibility of ingestion by the skin, we may give warm baths, to which gelatinous matter, in any form, may be added; or inunction, by means of cod liver or other oil, may be practiced.

But failing all other means, the question remains for our solution, whether we are warranted in imitating what nature occasionally effects by her own efforts, by inducing the premature expulsion of the fœtus. We shall not pause here to consider, as some have done at great length, the moral aspects of this important practical question. The idea involved is death to the fœtus, in order either to avoid risk to the mother, or to save her life, when that is in immediate and urgent danger; and no right-feeling man can decide in such a case without feeling that a grave moral responsibility rests upon his decision. We apprehend that when it is a mere question of freeing the woman from the risk of a contingent though not imminent danger, we are in no case warranted in sacrificing the life of the child, and we must therefore dissent from the conclusions of those who would sanction such a proceeding in any condition of the mother short of extreme peril. The conclusion at which Cazeaux and others have arrived is, that under no circumstances are we justified in inducing premature labor for the relief of the vomiting of pregnancy; but to this we cannot assent, although we admit that the cases which would warrant the operation are of extremely rare occurrence. That such cases do occur we cannot doubt, but let the young practitioner be assured that a life-long experience will scarcely bring such a case under his observation, and let him beware, therefore, lest, by exaggerating to himself the importance of the symptoms which are under his observation, he may, in his anxiety, be led into error. For his guidance we would call his attention to the following facts:

1. Cases have been recorded in which death has undoubtedly been the result, during pregnancy, of vomiting, and of the inanition consequent upon it. Two examples of this are narrated by M. Dance, in the "Archives Générales" for 1827, where the vomiting began with pregnancy and terminated fatally—in the one case at three, and in the other at three and a half months. Dubois met with twenty fatal instances in thirteen years, and Tyler Smith alludes to two cases "in which the induction of premature labor artificially was so long delayed that the patient died before abortion could be induced." Burns, on the other hand, says that "he has never known vomiting, purely dependent on pregnancy, end fatally;" and a similar observation is made by Désormeaux.

2. Numerous cases are recorded in which the operation was successfully performed, with immediate relief of the symptoms. Such instances, however, while they afford proof of the safety of the operation, are not to be admitted as, in any sense, arguments in favor of the practice; moreover, the result alluded to is far from being invariable.

3. Instances have occurred, in the experience of almost every practitioner, in which the symptoms, although of great severity, spontaneously ceased, and the labor reached a happy termination; and not a few are recorded, on excellent authority, which show that, at the last moment, and in the most desperate case, the symptoms may subside, and an equally satisfactory result ensue. In illustration of this, we may cite the following example, which occurred in the practice of Dubois:

> "A young German lady, two and a half months pregnant, had vomited almost incessantly from the first fortnight of her pregnancy. For six weeks she vomited every few minutes, and the smallest spoonful of fluid set up at once the most energetic contractions of the stomach. She was excessively emaciated and feeble; her breath was very fetid. In a word, the symptoms were so grave that M. Dubois called in Chomel. The prognosis of both was almost hopeless, and they left the lady, in the belief that she had but a few days to live. Two days after the consultation, the patient was seized with severe diarrhœa, and from that moment the vomiting ceased, and never returned. She could then take and retain some nourishment, the quantity of which was gradually increased until she regained her strength and full digestive powers."

This woman, then, after being so near death that two such able men considered it a hopeless case, made a perfect recovery, and carried her child to the full time. Dubois gives, quite frankly, the details of two similar cases, in which he proposed abortion. In both the women refused, and went to the full time.

A review of facts such as these should certainly lead us to use the greatest possible caution, when the question of premature labor comes, in such cases, under our consideration. It is unfortunate that the great majority occur in the early months of pregnancy,—a fact which increases our responsibility. For, if it were essentially a disease of the last, instead of the first weeks, we would provoke labor with much less hesitation, as we would then have a viable child, instead of an embryo, whose expulsion involves its death. The special circumstances which attend every such case should be taken anxiously into consideration, and our verdict must depend mainly upon these, but in full view of the experience of the past.

Among the other disorders of digestion to which pregnancy gives rise, Anorexia is sometimes prominent. The lack of appetite, amounting occasionally to actual disgust and loathing, is most marked in the early months, although not confined to that period. It is to be met by very careful attention to the normal functions, and by regulation of diet. The effect of tonics, although occasionally good, is not to be depended on; and it must always be remembered, in reference to the treatment of this and other disorders of the same class, that although we may mitigate symptoms and deaden sensibility within certain limits, we cannot annihilate the sympathy upon which the manifestation of these phenomena depends. It is far from unusual for the appetite to become depraved in a manner similar to what occurs in chlorosis; and this, in an aggravated form, constitutes the affection known as Pica. What usually occurs in healthy pregnancy is, that the appetite is altered but not depraved—milk, fresh fruits, succulent vegetables, and other articles of diet easy of digestion, being the form of "longing" which prevails. But when this takes a morbid direction, we find the desire for such substances replaced by a craving for raw rice, soap, chalk, cinders, slate-pencil, and even substances more disgusting. If the morbid longing be for such matters as may be prejudicial to health, they must of course be withheld, even by forcible means should this be necessary. It is, however, usual, and is certainly judicious, to humor the tastes as far as is possible, as they not unfrequently point to the class of diet which agrees best with the patient.

Gastrodynia and Pyrosis, if present in any marked degree, must be treated by precisely the same means which we would adopt in the same affection occurring in other circumstances; and for this purpose bismuth, calumba, and antispasmodics, combined if necessary with minute doses of opium, may be prescribed. In heartburn and acidity, Dinneford's or Hendry's fluid magnesia, or the effervescing citrate or bicarbonate of potash, may be administered in each case with every prospect of at least temporary relief to the symptoms. Constipation of the bowels is a very frequent concomitant of pregnancy, and is due to the pressure which is exercised by the pregnant womb upon the bowels, thus not only reducing its calibre, but also paralyzing to some extent its muscular fibres.

In other cases, there is a want of bile, and they who hold that there is during pregnancy a pseudo-anæmic state of the system, attribute the irregularity of the bowels to the same causes which operate in the early stage of chlorosis. In any case, whatever the cause may be, constipation is of constant occurrence, and women who were not previously of a costive habit frequently require laxatives during the whole course of their pregnancy. If clay-colored stools indicate that the function of the liver is interfered with, a few grains of blue pill given occasionally will often do much good. In the opposite condition of diarrhœa, which is by no means unfrequent, we must be careful to discriminate the nature of the case before pushing astringent treatment too far. If it depends upon fecal accumulation, or upon the presence of irritating matter in the alimentary canal, the first step in the treatment must be to clear out the bowels by castor oil, and then to exhibit, if necessary, such astringents as the nature of the case seems to call for.

II. The *Disorders of Respiration*, which accompany pregnancy, are by no means numerous. Dyspnœa is an affection which is very common in the later months, and is then due to the mechanical pressure exercised in the direction of the diaphragm by the expanding womb. Rest, careful attention to the digestive functions, and such arrangement of the dress as may tend to encourage thoracic and relieve diaphragmatic respiration, are the obvious and sole means by which this affection is to be combated. In the last weeks, the falling down of the womb which then occurs, will generally be found to put an end completely to the discomfort to which this affection gives rise. Dyspnœa may, however, exist at any period of pregnancy; and, when it occurs in the earlier months, it is probably due to sympathetic irritation communicated through the nerves. We have known the dyspnœa under these circumstances to be very harassing, and in one instance it was accompanied during the first five months with severe spasmodic asthma in the case of a lady who never suffered from that affection either before or since. Antispasmodics are obviously indicated in such a case, and, in the instance in question, great benefit was derived from a combination of chloroform with bromide of potassium. Cough, the result apparently of mere sympathetic irritation, is also an accompaniment of pregnancy in no small number of cases. It may be found to be associated with congestion of the base of the lungs, or with some more serious affection of these organs. As a rule, it exists independently of any ascertainable pulmonary disorder, but is, nevertheless, frequently spasmodic, and at times so violent as to resemble hooping-cough; and in these cases it may induce abortion. Some combination of sedatives and antispasmodics would be the best form of treatment for such a case,—the symptoms of which are often specially troublesome during the night,—and by promoting sleep, may prevent exhaustion and constitutional disturbance.

III. *Disorders of the Circulatory System.*—Careful analyses have been performed in order to determine the condition of the blood during the pregnant state. Among these, the researches of MM. Andral and Gavarret are conspicuous for the care with which they were conducted, and the interest which attaches to the results which they disclose.

They showed clearly that the plethoric condition of the circulation, which had been believed in by past generations of practitioners (and which was often treated by the ever-ready lancet), did not exist: and not only this, but that the condition which was to be observed in the greater proportion of cases was more of an anæmia than a plethora. The fact is, that, as a rule, an examination of the blood of a woman who is pregnant discloses alterations in the relative proportion of its constituents, which are closely analogous to what we may observe in anæmia from any cause. In the earlier months of pregnancy, it would appear that the blood deviates little from the normal standard, that the corpuscles are present in their usual number, and that the fibrin and albumen are scarcely altered in the proportion which they bear to the other constituents, the former being, if anything, rather diminished. In the later months, however, the blood is characterized by a remarkable diminution in the number of corpuscles, and a considerable increase in fibrin, while the proportion of albumen suffers no marked disturbance, what little change there is being, however, a diminution. An estimate has been made by the same observers, according to which they assume, that if we suppose the average number of corpuscles in the blood of healthy women who are not pregnant to be represented by the number 125, the average in women towards the end of pregnancy is probably not more than 115. If, in like manner, we take 300 as representing the physiological average of the fibrin, the proportion of that constituent up till about the sixth month may be set down at 250, while from this period onwards, during the last three months of gestation, it steadily increases in quantity, and reaches as high in extreme cases as 480. These physiological phenomena accord perfectly with the small clot and buffy coat which has been so generally observed while practicing venesection in the course of a pregnancy. The interpretation, however, which was formerly attached to this was, that the appearance was due to an inflammatory condition of the blood, and was consequently evidence that the practice which was being adopted was rational and judicious; but now, a more correct knowledge of true physiological principles enables us to recognize that such an appearance is quite compatible with the alterations which have been mentioned. In addition to the facts above noted as the result of analytical research, it has been further established more recently that the quantity of iron, as we would naturally expect from the loss of red corpuscles, is decidedly diminished.

Many of the symptoms of pregnancy, it must be admitted,—such as somnolence, weight in the head, flushing, ringing in the ears, and vertigo,—bear a striking resemblance to those which indicate chlorosis. As the lancet has, however, in this country fallen into disuse, it is unnecessary to repeat that such symptoms are no indication whatever of bleeding. There is, indeed, much reason to believe that the errors of a former generation have in this, as in some other respects, led to the absolute rejection of what is a powerful agent in the treatment of disease, and that in avoiding one extreme we have gone to the other. We cannot doubt, however, that in the treatment of the pregnant state this change has had a beneficial result, for with the blood in such a state as it is now demonstrated to be in the later months of pregnancy, no one even in former times would have thought of bleeding in an ordinary case of gestation. The analogy between pregnancy and chlorosis is most elaborately argued and worked out by Cazeaux, who goes so far as to assume that the system during pregnancy is in a state closely resembling anæmio-chlorosis, and that the treatment of pregnancy should in a great measure be based on a knowledge of this fact. "An animal diet," he says, "and the administration of chalybeates, have for many years seemed to me to be as useful against the functional disorders of pregnancy as against those of chlorosis."

We cannot, we confess, bring ourselves to admit, as Cazeaux seems to do, that an affection identical with chlorosis is a usual and normal condition of pregnancy. To do so would be to admit that a pathological state is the normal accompaniment of a physiological function, a view which we are certainly not prepared to accept. That the phenomena are so far identical has been proved, but there are other explanations which may be offered, which accord better with such analogies as may be drawn from known physiological and pathological laws. We may, for example, accept it at least as possible that the demand which is, under the circumstances of pregnancy, made upon the mother to supply the material necessary for the rapid development of the infant which she carries, may of itself cause what we are accustomed to consider a deterioration in the constitution of the blood. And yet this so-called deterioration may, for aught we know, be a wise provision of nature against the time when this demand shall suddenly cease. Indeed, although we have little fancy for theories in support of which we have no facts to advance, we do think that it is by no means improbable that the vital engine is, for a special purpose, worked at a low power during the last months of pregnancy. In this way at least, the tendency to post-partum inflammatory action may be diminished, as it is only by degrees, after labor, that the blood regains its normal and healthy composition. Or, again, this pseudo-chlorotic state may be in a great measure induced by inadequate nourishment, the result of the nausea and anorexia which so frequently occur. But, whatever the cause of the alteration of the blood may be, it is very doubtful whether iron can with propriety be administered in most cases of pregnancy. In certain cases in which special circumstances have induced us to prescribe it, we have found that its effect was less satisfactory than usual; and, that it did not allay digestive disorders, but rather, from its tendency to increase the sluggish action of the bowels, which is so frequently a complication of pregnancy, seemed, in some cases at least, to aggravate them.

In thus opposing the view that pregnancy should be treated as a disease, when it presents what we recognize as its normal condition, we must guard ourselves from the possibility of misconception. There are cases, undoubtedly, in which the symptoms are such that we are bound to look upon them as cases of chlorosis; nay, we may go further, and admit that such cases are by no means of very rare occurrence. Circumstances render it highly probable that many of the signs of pregnancy are intimately associated with the diminution of the blood-corpuscles already alluded to, but it seems somewhat curious that these symptoms are often present during pregnancy, while the healthy ruddy complexion of the patient discourages the idea of chlorosis. In accounting for this, we must bear in mind, as Scanzoni observes, "that there is a form of chlorosis in non-pregnant women, in which the patients, in spite of the fact that the relative quantity of blood-corpuscles has undergone diminution, preserve a quite healthy color, so that it is conceivable that, in pregnant women also, the pale color of the general surface is no pathognomonic sign of a diminution of the blood-corpuscles." To this we would only add, that it consists with the experience of all that pallor is quite as frequent in the early as in the late months of pregnancy, although in the former case the alteration in the relative proportion of the blood-corpuscles is as yet scarcely if at all disturbed.

In a certain number of instances, however, the deterioration of the blood has its origin at an unusually early period, and, running its course with great rapidity, leaves the woman, before many weeks have passed, in a state in which all the symptoms of chlorosis in its higher grade may be manifested; and those symptoms are all the more marked when the chlorosis has preceded conception. In all such cases, the course of gestation is more or less disturbed by the characteristic symptoms of the disease, and an influence is not unfrequently exercised upon the duration of pregnancy by the occurrence of exceptionally violent symptoms, which may give rise to premature delivery. The experience of those who have devoted most attention to this subject seems to show that no hurtful influence is exercised by chlorosis in the progress of labor, but that a common result is that convalescence is greatly protracted, and that there exists an increased tendency to hemorrhage. In which case also, it has been remarked that there is an increased liability to diseases which are the sequelæ of labor, such as Phlegmasia Dolens; and, in the case of epidemic Metria, that disease is apt, when it attacks a chlorotic woman, to assume some one of its more rapid and fatal forms. The treatment of the chlorosis of pregnancy is to be conducted on the same principle as under other circumstances. It will thus consist mainly in careful attention to the general health, special attention being given to the diet, which should in all cases be generous, and contain a considerable proportion of animal food. Stimulants in some form are also indicated, the red wines of Bordeaux, Burgundy, and Hungary, being perhaps superior to all others in the treatment of this class of diseases. In this respect, however, tastes as well as constitutions vary considerably, but, as a rule, the milder stimulants will be found to suit better than those of greater alcoholic strength, unless, indeed, sinking, or even collapse, the result, it may be, of some form of hemorrhage, should call for more energetic measures. The only class of medicines which stand prominently in advance of others in the treatment of chlorosis are of course the various preparations of iron, which should therefore in every case be tried. If the bowels are constipated, the iron should be combined with a laxative, but our own impression is, as has already been observed, that it is, as a rule, less efficacious in pregnancy than under other circumstances.

Plethora, in its wider sense, is a comparatively rare affection of pregnancy. Local Plethora or congestion is of course common enough, and is the result generally of mechanical pressure exercised either upon the organs affected or upon venous trunks. A certain number of cases do, however, actually occur in those whose temperament renders them liable to hyperæmia. In those instances, the symptoms of pregnancy are different from such as are ordinarily observed, but are by no means rendered more bearable. In fact, the vertigo, ringing in the ears, flushing, and severe headache, greatly aggravate the discomfort of the woman. If these indications are disregarded, and the symptoms unchecked, nature may relieve herself by the spontaneous occurrence of hemorrhage; and, if the flow of blood should take the direction of the utero-placental, or utero-decidual system, a very natural result will be the premature expulsion of the fœtus or embryo. The treatment proper to such cases will consist, in the milder form, of simple regulation of the diet and mild laxatives. We must not here as in the chlorotic cases, encourage our patient to use animal food with freedom, but, on the contrary, we must enjoin abstinence, complete if need be, from such articles of diet, and even from the milder stimulants,—light soups, cooling drinks, and a large share of vegetables being substituted for more stimulating materials. Our object here is to keep the supply in proper balance with the assimilative powers, so as to reduce the tendency to hyperæmia; and our efforts in this direction will be greatly aided by the use of laxatives, of which the salines are the best for the purpose, beginning, perhaps, in the first instance with a more active cathartic. When the symptoms are so severe as to lead us to apprehend serious results, such as convulsions, we may fearlessly have recourse to bloodletting, which may be practiced from the arm in the usual way; or, if there be evidence of a special determination of the blood in any one direction, such as the brain, the kidneys, or the womb, local abstraction of blood by leeches or cupping-glasses may in these instances be preferred. In such cases the bleeding must be followed by the general treatment above indicated, which should be rigorously maintained, it may be continuously, or at such intervals as seem necessary, during the whole course of the pregnancy.

The pressure which, during the pregnant state, is exercised upon the venous trunks, gives rise to a number of symptoms which are thus due to a cause purely mechanical. Among the more common of these is a varicose condition of the veins of the legs and lower part of the trunk, which, when trifling, may be disregarded, but, when severe, should be treated by bandages, the pressure of which must be carefully regulated. Should this condition of the veins have preceded impregnation, the symptoms may be so severe as to suggest to the mind the possibility of relief by some operation with a view to a radical cure. It need scarcely be said, however, that, under the circumstances of pregnancy, the chances of a favorable result from any such operation are extremely improbable; and, moreover, the immediate effect of the operation might be to disturb the progress of gestation. Hæmorrhoids spring from the same mechanical cause as the preceding affection, and are besides very greatly aggravated by the habitual constipation which is of such frequent occurrence during pregnancy. However severe the suffering may

ich they give rise, there are scarcely any circumstances which
arrant us in excising, ligaturing, or otherwise operating with a
the cure of this troublesome affection. Nor is it proper even
leeches to the part, if it be true, as has been asserted, that
y cause abortion; and besides, Désormeaux tells us that he
r known the application of leeches to, or incision of, these tu-
pregnancy attended with any durable amelioration in the symp-
The treatment of hæmorrhoids must consist, therefore, in meas-
ich are purely palliative. If they are painful, sponging with
ater, or fomenting with sponges wrung out of hot water and
successively as hot as can be borne, is often attended with the
possible relief and comfort. Of local applications, nothing
is superior to the well-known Unguentum Gallæ cum Opio.
emorrhage is a prominent symptom, it may be necessary to em-
re active astringents, but what is more useful is cold injections,
ay be quite freely used without risk.[1] It is doubtful whether
-baths are advisable, as the risk in that case of exciting uterine
increased.

ave already observed, as a sign of pregnancy, the distended con-
f the small veins of the vagina, which gives rise to an altera-
he color of the part to a different tint. If the pressure be un-
great, these veins may assume a varicose appearance, but if this
he result, no interference is necessary, and the inconvenience is
ing. In another and more severe class of cases, rupture of the
d vessels takes place, and the result is the formation of a livid
usually limited in extent, and situated for the most part in one
of the labia. This tumor constitutes a Thrombus of the vagina.
arance, which is usually sudden, is attended with considerable
d its immediate cause, in many instances, is to be traced to
alls, or violent efforts of any kind. It is very variable in its
nd termination, and may end by resolution like a thrombus in
r situation, in which case it is of very short duration. It may
e also in rupture, which gives exit to the pent-up blood, and
s give relief and lead to a speedy cure; or the hemorrhage
o excessive as to cause great apprehension, and it has even ter-
in death. In other cases, suppuration and gangrene have been
ediate effects, and from the latter process a fatal result has also
The condition of the parts during pregnancy renders this affec-
e serious than when it is independent of the process of gesta-
l it is not until delivery has taken place that we can look for
This is, however, by no means always the case, for the relaxa-
ch then occurs facilitates the further effusion of blood, and we
refore have, immediately after delivery, a serious increase in
of the tumor. For a similar reason, thrombus is occasionally
d for the first time after labor, and in these cases there is more
f its acquiring a considerable size.

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ux recommends the administration every night of a full enema, to be given
when this has been evacuated, a second is to be given, about a fourth of
of the first: the latter to be retained.

The treatment of vaginal thrombus is a point of great nicety and importance. In those cases in which there seems to be a tendency towards resolution, and in which the density of the tumor becomes increased while its bulk diminishes, no active interference is called for, and our duty is simply to watch the progress of the case, lest circumstances should arise to call for prompt action. In cases, on the other hand, where the tumor is of large size, so as to fill a considerable portion of the pelvis, and form an obstacle to the functions of surrounding parts; or when it is fluctuating throughout, showing that it contains a vast reservoir of fluid blood, and when there is reason to believe that the hemorrhage into the tissues is still going on; or, again, when there is pointing and other evidence that at any moment spontaneous rupture may occur—and in all these cases evidence that the vital powers are on the wane—we cannot hesitate, but must act by at once incising and giving.vent to the effused blood. The two groups of cases above cited are extremes, but there is another, forming probably the largest number of all, which may be supposed to occupy a place intermediate between them. In this class, while the symptoms are neither such as to make us confident in the approach of resolution nor to cast aside as injudicious the idea of further delay, we are constrained to wait, with varying hope and apprehension, as long as the health of the woman will admit of it, until the features of the case become so marked in one direction or another that our course of procedure is definitely fixed. A special class of cases are those in which a thrombus during labor threatens to be an actual impediment to its progress, and in which, for that reason, irrespective of others, we are constrained to operate.

In all cases in which incision has been determined upon, we must in the first place take care to make the aperture a free one, for if a small opening only is made, nothing will escape but fluid blood, and all the clots, which constitute probably the greater portion of the bulk of the tumor, will be left behind. If the clots are adherent, or firmly inclosed in the interstices of the tissues, care must be taken in dislodging them, lest we should unnecessarily give rise to fresh hemorrhage. As regards the point of the tumor at which we are to operate, we must, in the first instance, be guided by the fact whether or not there is any indication of pointing, and, if so, our choice must fall upon the site so indicated. But if there be no pointing, and seeing that the thrombus is very generally situated in the labia, and has thus a cutaneous and a mucous surface, the question arises through which of these is the incision to be made. On this point, most of those who have written on the subject are agreed that to make the opening from the cutaneous side gives the patient the best chance. The freer exit for the discharges, the protection of the wound from the lochial and other irritating fluids, and the improbability of there being in future labors a cicatrix which might again give way, are among the reasons which have been urged in favor of this mode of procedure. The inflammation which usually supervenes upon the operation must be combated by appropriate means, such as strict cleanliness, and appropriate lotions and injections. The prognosis of all such cases is far from favorable. "Of sixty-two cases," says M. Deveux, "which have come to my knowledge, the women died in twenty-two, either during pregnancy, or labor, or afterwards. And with the exception of one case, all the children of these twenty-two women died."

CHAPTER XIV.

DISEASES OF PREGNANCY (CONTINUED).

IV. DISORDERS OF SECRETION AND EXCRETION—PTYALISM—INTERFERENCE WITH FUNCTION OF KIDNEYS AND BLADDER—RETENTION; MECHANICAL OR FROM PARALYSIS—ALBUMINURIA: STATE OF THE BLOOD IN: PECULIARITIES OF THE PUERPERAL FORM: CONNECTION OF WITH PUERPERAL CONVULSIONS: SYMPTOMS, PROGNOSIS, AND TREATMENT—THE PHOSPHATIC DIATHESIS IN PREGNANCY—LEUCORRHŒA AND GRANULAR VAGINITIS—ASCITES—DROPSY OF THE AMNION—HYDRORRHŒA. V. DISORDERS AFFECTING LOCOMOTION—RELAXATION OF THE PELVIC ARTICULATIONS: INFLAMMATION OF. VI. DISORDERS AFFECTING THE NERVOUS SYSTEM—AFFECTIONS OF THE SPECIAL SENSES—EFFECT ON THE MORAL AND INTELLECTUAL FACULTIES—ABDOMINAL AND UTERINE PAIN. VII. DISPLACEMENTS OF THE GRAVID UTERUS—PROLAPSUS—ANTEVERSION AND ANTEFLEXION: SYMPTOMS AND TREATMENT OF—RETROVERSION; HOW CAUSED ORIGINALLY: CHRONIC AND ACUTE FORMS: SYMPTOMS AND TREATMENT OF EACH: OPERATION FOR THE REDUCTION OF—OBLIQUE DISPLACEMENTS.

IV. *Disorders of Secretion and Excretion.*

PTYALISM, which has already been mentioned as a concomitant of pregnancy, is occasionally excessive, and may thus give rise to such annoyance as to cause the woman to apply for relief. It has generally been observed as an affection of the first weeks of pregnancy only, and rarely lasts more than two months: if it be excessive, or of longer duration than usual, it may be relieved by the use of gum arabic, tamarind water, ice, or some gentle astringent.

The function of the kidneys is not, as a rule, in any way disturbed by gestation.[1] It is, however, otherwise as regards the bladder, which from its situation, is peculiarly liable to be affected in its function by the pressure to which it is subjected. Annoyance from this source is seldom experienced in the early months of pregnancy, but, in the last weeks, when the uterus has fallen downwards, as is usually the case prior to delivery, the pressure then brought to bear upon the neck of the bladder, which is compressed between the head of the child and the symphysis, may give rise to intolerable annoyance, for the relief of which, prompt action is frequently required. In many cases, the woman is able to relieve herself perfectly by placing herself on her knees and elbows, when, the weight of the child being transferred to the fundus of the womb, the mechanical obstacle is at once removed, and she is able to micturate without difficulty. The cases in which the greatest amount of difficulty exists are those which are accompanied by anteflexion of the womb, when the pressure upon the bladder is for obvious anatomical reasons more severe. Complete retention of urine is occasionally the result, and, in such a case, the bladder may become enormously distended, and in an unnaturally elongated form may reach as high as the umbilicus; and, indeed, cases have been recorded in which death has taken place from rupture of the bladder, and escape of the urine into the peritoneal cavity. Fortunately, however, it is only on rare occasions that the retention is complete, but it is by no means unusual for the practitioner to be summoned to relieve the almost constant irritation from which the woman suffers, in consequence of the difficulty which she experiences in her efforts to empty the bladder. If this difficulty is not relieved by change of posture during the act, an abdominal bandage, carefully adjusted, and worn so as to give support to the uterus, will often be productive of the most satisfactory results. But, failing such means, it will be necessary, in some instances, to use the catheter, and in this manner to relieve the bladder. With the ordinary female catheter, considerable difficulty may often be experienced, as it is too straight and too short to be adapted to the altered anatomical relations of the urethra and bladder; and, indeed, its use is not free from risk. It is, therefore, much better to use an elastic catheter, by means of which the operator will, even in cases of complete retention, rarely fail to effect his purpose. In cases where the compression is comparatively trifling, it may act in another way, by inducing paralysis of the sphincter vesicæ, and a constant escape of the urine drop by drop. In one case, this was observed by Scanzoni as early as the third, and disappeared entirely so soon as the uterus had risen out of the pelvis in the fourth month. Catheterism may be employed as often as is necessary; and the catheter may be left in for several hours, while the woman lies quietly on her back, should the symptoms not yield to the simple emptying of the bladder. Sometimes, in the last months, she experiences a smarting, or more severe pain in micturating, which has been found to depend, in many instances, upon a catarrh of the bladder, or at least of its neck; under which circumstances, whitish flakes and purulent matter in the urine will disclose the nature of the case, for the treatment of which, the only safe means which can be adopted are baths, bland drinks, and emollient applications. This affection may be associated with spasm of the neck of the bladder, which may also exist independently of any local disease, the irritation which causes it being sometimes due to pressure, and at other times to a reflex irritation starting from the uterus.

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[1] The formation of Kiestein has already been referred to.—See "Signs of Pregnancy."

The existence of *Albuminuria* as a disease of pregnancy, was first discovered by M. Rayer, and in this country was brought under the notice of the profession by Dr. Lever. Previous to this, there can be no doubt that many cases were set down simply as instances of œdema, due to pressure (the Œdema Gravidarum of the old writers), which were, nevertheless, caused by the presence of albumen in the urine, or by the changes in the kidneys upon which that symptom usually depends. Under ordinary circumstances, the presence of albumen in the urine is looked upon as symptomatic of very serious organic disease, and experience abundantly shows that we have only too good reason to look forward in such cases with the gloomiest anticipations as to the future. There are, however, exceptional instances, such, for example, as arise in the course of scarlatina, in which our prognosis is vastly more favorable. A knowledge of these facts has given rise to numerous speculations as to the nature and exact import of the symptom, when it is observed in the course of pregnancy. The question, in fact, is—are we to consider the albuminuria of pregnancy as indicative of serious disease of the kidneys; or are we, on the other hand, to look upon it as an exceptional symptom of pregnancy, and one to the disappearance of which after delivery we may confidently look forward? In considering, in the light of modern investigation, what answer should be given to this query, we note, in the first place, the fact that the albumen in the blood is somewhat diminished during pregnancy. Along with this we have the researches of Blot and Litzmann, who, by a series of independent observations, have shown that albumen exists in the urine in more than twenty per cent. of pregnant women; and, in the case of primiparæ, the percentage is considerably higher even than this. If we were to admit, therefore, that albumen in the urine was here a pathognomonic sign of equal significance with that which occurs independently of gestation, we must conclude that the mortality of pregnancy and childbed would be thereby in a very great degree augmented. But, as experience shows us the contrary, we are thus, on the very threshold of the inquiry, forced to admit that the albuminuria of pregnancy is comparatively an innocuous disease.

That childbed mortality is, directly or indirectly, increased in some measure by the presence of albumen in the urine, and the associated phenomena, is a fact which no one in these days will gainsay. Among the phenomena here alluded to are puerperal convulsions, a subject to which we shall, at a later period, have occasion specially to refer, as the affection in question is one upon which the most serious results not unfrequently ensue. This is, in fact, one of the most interesting and practically important points in connection with the subject, to the demonstration of which Simpson contributed in no small measure, by establishing the intimate association which exists between convulsions and albuminuria. But, the unhappy results which frequently attend this complication fortunately do not indicate the ordinary course of an uncomplicated case of albuminuria in pregnancy. The frequency with which this alteration of the urine is to be observed, as has been shown by the observations of Blot and Litzmann already referred to, is sufficient to prove that a large proportion of cases are unattended by any marked symptoms, and, therefore, we may assume, run their course without the nature of the case being so much as suspected. And, moreover, this idea receives the strongest possible confirmation from the fact which experience has fully disclosed, that, in the majority of cases in which albumen is actually detected in the urine by chemical examination during gestation, the general health is little if at all affected, and the normal constitution of the urine is restored within a short period after delivery.

The symptoms of this affection are, then, in the mildest cases, either such as to attract no attention or are confounded with those which naturally arise from, or are associated with, the pregnant state. When, however, dropsical effusion takes place,—which is not, like that which has already been alluded to as the result of mere mechanical pressure, confined to the lower limbs, but affects more or less extensively the whole body,—our suspicions should be at once aroused, and a careful examination instituted, when the presence of the abnormal element in the urine will usually be detected. In extreme cases, the legs are enormously swollen, and the vulva and vagina tumefied; and the characteristic puffiness of the face, with swelling of the upper limbs and of the abdominal walls, indicate still more clearly the nature of the case. The urine is scanty, of high specific gravity, and may become solid on boiling. In the worst cases, and especially in those in which convulsions occur, there is considerable headache, dimness of vision, and amaurosis,—which latter often comes on quite suddenly, immediately before a fit. The blood poisoning which gives rise to these epileptiform seizures consists, as the observations of Christison and others have conclusively shown, in the presence in the blood of urea, which is not eliminated in consequence of the perverted condition of the renal function. It has been demonstrated experimentally, that placing a ligature on the renal veins, and thereby disturbing the balance of the circulation in the kidneys, causes the appearance of albumen in the urine. From this the inference has been drawn, that the albuminuria of pregnancy was due to the pressure exercised by the gravid uterus. That this is the case in many instances we cannot doubt, but at the same time we are inclined to believe that the explanation has been too readily accepted as the solution of every case. The fact of its greater frequency in primiparæ and in twin pregnancy, where the pressure is obviously greater, no doubt lends confirmation to the view alluded to; but, on the other hand, instances occasionally occur in which, at an early period of pregnancy, albumen may be detected before any such pressure as would account for it on the above hypothesis could by any possibility occur. "In such cases," says Dr. Tyler Smith, "the disease appears to me to depend upon reflex irritation of the kidneys by the gravid uterus, similar to the irritation of the salivary glands, the mammæ, thyroid, &c., and not upon mere pressure alone." If the symptoms continue unchecked, the general health of the patient becomes seriously compromised. The anæmia and waxy pallor which is so characteristic of the more advanced stages of Bright's disease now become manifest. This is supposed by modern pathologists to be due, mainly, to the poisoning of the blood by the urea, which takes the place in that fluid of the lost albumen; while, by subsequent decomposition, the urea is converted into ammonia, which has been detected in the blood and in various secretions.

The existence of puerperal albuminuria is, as a rule, only recognized during the last months of pregnancy. It by no means follows, however, that this marks the period at which it is first present in the urine.

On the contrary, we may be certain that its recognition is often deferred to that period, simply because the symptoms have not been such as to attract particular attention. There is too good reason to believe, indeed, that, even in cases where the symptoms ought to have excited suspicion, the idea has never been entertained until the occurrence, during labor, of violent convulsions, for the first time directs attention to the fact. The greatest variety exists in the progress and duration of the disease. In some of the cases which have been most carefully noted, the presence of the albumen has not been constant, but has either oscillated in regard to quantity, or has ceased completely for days, to return again,—thus repeatedly intermitting during a considerable period. In others, the affection appears to gain ground as the pregnancy advances, and ultimately to culminate in that form of granular degeneration of the kidney which constitutes the disease of Bright. There are, of course, cases in which women who are already the subjects of Bright's disease become pregnant, and in whom all the symptoms suffer aggravation. But what we refer to at present exclusively are those cases in which, at some period in the course of a pregnancy, albuminuria makes its appearance for the first time. The instances in which no serious kidney lesion exists, constitute, happily, the great majority. In such, the albumen usually disappears shortly after delivery; but, in others (as we not unfrequently see after scarlatina), the albumen persists for many mouths, although the general symptoms are not necessarily severe. Much information may be derived, in doutful cases, from a microscopie examination of the urine: and in this way, too, our prognosis will, in a great measure, be formed, as the presence of tube-casts, and their microscopic characters, will often reveal the nature and stage of the renal degeneration, should it exist. Headache, sickness, and the various forms of digestive disorder which are so frequently associated with pregnancy, are, under the influence of albuminuria, often greatly aggravated; and there can be no doubt that the morbid alteration in the blood gives rise, as has been observed by M. Blot and by Tyler Smith, to dangerous hemorrhage during or after labor.

In reference to the question of treatment, it is obvious that it must be of no small importance to ascertain, as early as possible after its development, the presence of the albumen. More especially is it of importance to be possessed of this information, in order that we may adopt such measures as may remove, or at least mitigate, the symptoms, before the period of labor arrives, at which experience teaches us to dread the occurrence of convulsions, and the alarming results which spring from uræmic poisoning. In every case in which the symptoms point in that direction, including even the minor forms of œdema, it is well, as a matter of routine in practice, to test the urine for albumen. Its presence may, doubtless, be discovered in many cases in which no other symptoms exist, and the health of the woman is excellent. If so, the treatment will consist in careful regulation of the diet and of the functions, and in occasional observations of the urine, with the view of obtaining the earliest possible information of any morbid change. If the case is one wholly due to pressure, no serious symptoms whatever may be manifested, and the case may continue until the end of pregnancy, with the result of a happy labor and perfect recovery. If the general system seem to participate in the morbid process, and there is lumbar pain and general febrile excitement, great relief will frequently follow the application of a few leeches to the loins, to be followed by diligent fomentation. Antiphlogistic treatment of any kind, more especially in such cases as are not observed until the disease has made some progress, must be resorted to with the greatest caution. For it must be remembered that the disease is one of debility, and implies impoverishment of the blood,—a condition which calls more for a tonic treatment and a generous diet. Baths of various kinds are often useful, being at once grateful to the feelings of the patient and likely to promote the function of the skin. The use of diuretics has also been recommended; but, if used, these agents should be employed cautiously, and in the mildest form. In a case which came under our observation lately, a lady aged 34, pregnant for the first time, had œdema of the ankles about the beginning of the sixth month, when a trace of albumen was discovered,—the urine being very scanty, high-colored, and loaded with lithates. The treatment adopted was the bitartrate of potash, with Rochelle salts and benzoic acid, which kept the symptoms somewhat in abeyance, and manifestly improved the function of the kidney. The general health did not deteriorate, but the general dropsy increased, the quantity of albumen in the urine fluctuating considerably. All went on well, but, in the last stage of a tedious labor, the patient was seized with a most violent epileptiform attack. She was at once delivered with the forceps, made a good recovery, and in six weeks all trace of albumen had disappeared. In the above case, the benzoic acid was given, as recommended by Frerichs, with the view of neutralizing the ammonia which forms in the blood from the decomposition of the retained urea.

Dr. Tyler Smith has pointed out, as an occasional accompaniment of pregnancy, the habitual occurrence of a large quantity of triple phosphate in the urine, which, under the circumstances, is of high specific gravity, and has an alkaline reaction. The same observer has noticed, further, that in some cases in which this phosphatic diathesis has been found to exist, fatty degeneration of the placenta had occurred in successive pregnancies. The treatment of such cases consists in the use of the mineral acids, opiates, rest, and a nutritious regimen.

A hypersecretion of the mucous membrane of the vagina constitutes a troublesome form of *Leucorrhœa*, which is of frequent occurrence during pregnancy. A certain degree of this increase in the action of the glandular structure, is to be looked upon as an ordinary accompaniment of pregnancy, due to the increased vascularity which is inseparable from gestation, and which manifests itself, as we have already seen, in a change in the color of the membrane. This, of course, requires no treatment beyond ordinary attention to cleanliness. But the quantity of the discharge is occasionally excessive, and varies greatly in its appearance, being in one case clear, in another milky, and in a third yellow and creamy like ordinary pus. Such a condition will be found occasionally to be associated with a growth of papillary projections on the surface of the membrane, which are sometimes as large as small peas, but are more generally very minute and spreading over the whole vagina, giving to it a granular appearance. This is what has been called Vaginitis Granulosa, an affection which is generally accompanied with irritation and uneasiness, amounting in some instances to pretty severe pain, or, what is even worse, intolerable itching of the parts. The latter symptom may give occasion, even during sleep, to rubbing and scratching of the vulva, which may cause ultimately severe excoriation, and much suffering. When circumstances render it probable that a specific cause exists, we must of course be on our guard against mistaking gonorrhœal or syphilitic discharges for that which we are now considering, and in cases where the diagnosis may be difficult, the presence of condylomata and other unequivocal specific appearances will serve to remove all doubt. Generally, when the affection is due to pregnancy, even the most profuse discharges rapidly disappear after delivery, and seldom attract any notice after the lochia have ceased to flow. Cases, however, occasionally occur in which such a discharge, originally appearing during pregnancy, lasts during the convalescence after labor, and ends in an obstinate and troublesome vaginal leucorrhœa. The treatment of this affection must necessarily be confined within certain limits, so that sometimes palliation is the most we can hope for. Cauterants, or strong injections, cannot be employed, lest they should induce premature labor, and even the simplest injections must, if used, be employed with the greatest possible caution, as it is well known that repeated injections, even of tepid water, will often suffice to induce uterine contractions. The resources at our command are, on this account, extremely limited, and in most cases must consist in cleanliness, warm baths, and emollient applications. Medicated pessaries of various kinds, such as those which are made with tannin, or with alum and catechu, may also be used with safety and with every prospect of success. If there is much irritation or itching, the ingredients may be varied at will to meet these indications.

General Dropsy, as symptomatic of, or coincident with puerperal albuminuria, has already been fully noticed. There are other forms, however, of dropsical disease which require attention, among which are Ascites, Dropsy of the Amnion, and the affection known as Hydrorrhœa, each of which calls for special remark. *Ascites* is a form of dropsy, familiar to the physician, which takes the form of effusion within the peritoneal cavity, and which is of frequent occurrence during pregnancy. Sometimes it is developed at an early stage of gestation, in which case we should look upon the symptoms with considerable apprehension, as experience has shown that the result in such cases is very generally fatal to child or mother, or to both. It is rare, however, that it develops itself before the fifth month, and if the patient reaches the termination of the sixth month without ascites, it is unusual for the symptom to manifest itself for the first time after that period. A certain amount of effusion may take place within the peritoneal cavity without attracting any special attention, but as pregnancy advances, the amount of distension is out of all proportion to the stage which has been reached. Examination by the usual process of palpation discloses the fact, in the same manner as under ordinary circumstances, but the site of the chief effusion is varied somewhat in consequence of the presence of the distended uterus. On that account, fluctuation will be perceived most distinctly in the hypochondriac regions, and especially on the left side. The distension, as the case goes on, continues to increase, to such an extent as to press injuriously upon the diaphragm and disturb the functions of the thoracic organs, while the amount of mechanical pressure is further shown by the projection of the umbilicus, which often takes the form of a protrusion several inches in length, and as translucent as the scrotum in hydrocele. The abdominal walls become œdematous and pit on pressure, and if the case is still unchecked, the whole body becomes œdematous and enormously swollen, while the blue lips, labored breathing, and rapid feeble pulse show how much the general functions are disturbed. In the course of such a case, the diagnosis of pregnancy is seriously interfered with, and it may be impossible to make out the presence either of a solid body or a distended uterus; and, besides, there is good reason to believe that, the uterus being separated to a greater or less extent from the abdominal walls, the sensation of quickening is deferred to an advanced period of gestation, or in some cases is never felt at all, although the child is alive and vigorous. The worst cases of all are those in which ascites is complicated with dropsy of the amnion, when the prognosis is very unfavorable.

Caution must be exercised in the treatment of puerperal ascites, in so far as the use of drugs is concerned. It would appear, indeed, that not only is the free use of purgatives and diuretics prejudicial to the pregnancy, and apt to bring on labor, but also that those agents have very little effect, in such cases, in checking the advance of the malady. We ought, however, always to try them before resorting to other measures, but should they fail, and the distension be such as to threaten the life of the woman, we have no choice left save between paracentesis and the induction of premature labor. In deciding between these two modes of procedure, we must be guided by the peculiarities of individual cases. The operation of paracentesis will be preferred in all such as may show a reasonable prospect of thus relieving the woman and allowing the pregnancy to run its course, thereby saving both mother and child. It must be remembered, however, that the operation is very frequently succeeded by uterine contractions, so that the very measure which is adopted with a special view to the safety of the child, may possibly be the cause of its expulsion. In regard to the operation itself, it is clear that we cannot, without incurring the risk of wounding the gravid womb, operate in the ordinary situation; so that another site must be selected. Scarpa operated in the left hypochonder, and Ollivier punctured on several occasions the protruding umbilicus with an ordinary lancet, and either of these modes of procedure might be adopted in cases where the operation had been, after due consideration, resolved upon. We confess, for our part, that, seeing the frequency with which premature labor has followed spontaneously upon the operation of paracentesis, and the risk of peritonitis which the woman must run as a consequence of it, we are inclined to look with more favor on the induction of premature labor as the proper measure to resort to in extreme cases. The nearer such a case approaches to the full term of gestation, the less need we hesitate in adopting this course, but even when it involves the certain loss of the child, we believe that the most judicious course would be to adopt this, in preference to paracentesis, at least in the majority of cases.

Dropsy of the Amnion.—There is, as has already been observed, a very great variety, consistently with quite normal gestation, in the quantity of the liquor amnii. It is, therefore, a matter of no little difficulty to determine the point at which the quantity becomes abnormal, but we shall probably not be far wide of the truth if we put down the limit at from two to three pints, so that if the quantity should exceed this, the case may be held to come under the category of dropsy of the amnion. In extreme cases, from thirty to forty pints of fluid have escaped from the uterus. It was at one time generally believed that this form of dropsy was associated with some special morbid condition. It has been supposed, for example, to be due to inflammation of the amnion, constitutional syphilis, or to some diseased condition of the fœtus; but, although all these theories are possible, none of them have up to this period been demonstrated. It seldom has been observed before the fifth month, and is much more frequent in twin pregnancies.

If any difficulty should be found in distinguishing between ascites and dropsy of the amnion, attention to the following points, which are laid down by Cazeaux as diagnostic, will generally enable us to make the distinction, if the cases are uncomplicated; but it must not be forgotten that the two affections may coexist. In ascites the urine is scanty and thick, and the lower limbs and genitals are œdematous. There is also fever and constant thirst. It is difficult, if not impossible, to recognize the outline of the uterus, and in the course of our examination by palpation distinct fluctuation is to be detected. In dropsy of the amnion again there is normal urine and little thirst. The lower limbs are often perfectly free from œdema, or, if it be present, it is so to a comparatively small extent. The rounded form of the distended uterus can generally be made out, but the fluctuation is very deep-seated and obscure. There is rarely any umbilical projection, and if so it is not transparent. The distension from dropsy of the amnion is sometimes enormous, and may threaten death by apnœa, by interfering with the function of the lungs. The natural relief which has, in such cases, followed upon spontaneous rupture of the membranes and the escape of the fluid, points very clearly to the only method of treatment upon which we can rely; for, whatever may be the opinions entertained with reference to ascites, there can be no doubt that, in the affection we are now considering, the only operative procedure applicable to cases where life is in danger is the induction of premature labor by rupture of the membranes. If the symptoms are not urgent, and the distension not excessive, careful attention to all the functions is the only mode of procedure which can be adopted, seeing that diuretics and purgatives are of no avail, and besides, that the pregnancy may possibly come to a satisfactory termination. The result of this affection is very serious as regards the life of the child, but seldom implicates that of the mother, nor indeed, as a general rule, does it seriously affect her health. The natural result is spontaneous premature expulsion.

Hydrorrhœa.—In this singular affection, which has also been called "false waters," a discharge of fluid takes place from the uterus, the amnionic sac remaining entire, and the phenomenon being neither preceded nor necessarily followed by uterine contractions. This occurs pretty frequently towards the end of pregnancy, and even, although the quantity of fluid discharged may have been considerable, and lead to the idea that premature rupture of the membranes had occurred, labor, when it eventually occurs, is found to be accompanied in the first stage, as usual, by the formation of the "bag of waters." The circumstances under which the discharge occurs vary considerably. In some cases it has an obvious connection with some powerful effort or accidental violence, while in others it comes on while the patient is at perfect rest, or even during sleep. In one case the discharge may occur as a gush; in another it may escape *guttatim;* or, it may come on in either of these ways, and then, ceasing completely, may again and again return. The discharge is, in the first instance, at least, attended by no pain, but in those cases in which the quantity is large and the escape sudden, uterine contractions are apt to supervene, and premature delivery thus to ensue.

The cause and source of a serous and usually colorless discharge which comes from the uterus during pregnancy, and is not the liquor amnii, constitute points of considerable interest, and to account for the phenomenon many theories have arisen. The only one, however, which it is necessary to mention here, as it is that which is almost universally accepted, is that the affection arises from a secretion which has its source in the inner surface of the uterus, and which, in proportion to its quantity, separates the coverings of the ovum from their uterine attachments. A pouch is thus formed between the decidua and the womb, which gradually increases as more fluid becomes effused, until, making its way downwards towards the cervix, it finds a mode of exit, the fluid then escaping into the vagina and making its appearance externally. The occurrence of this should give rise to no apprehension, further than that which may arise from the risk of premature expulsion. The treatment consists in enjoining strict rest in the horizontal posture, in order to reduce this risk to a minimum; and, if the gush has been sudden and the quantity large, it will also be proper, with the same object, to give an opiate in some form, to allay possible uterine excitement. The only practical mistake which might be made in such a case would arise from an error in diagnosis, for if we believed the discharge to indicate rupture of the membranes, we might, naturally enough, rather encourage the coming on of labor, believing that to be inevitable.

V. *Disorders affecting Locomotion.*—Attention has already been directed to the fact now fully recognized, although long disputed, that a relaxation of the various pelvic articulations is an essential and physiological accompaniment of the pregnant state. This consists in a thickening of the cartilaginous, and a softening and relaxation of the ligamentous structures surrounding the articulations in question. Along with this, there is a greater afflux of blood to the parts, and the more perfect structure of the joints at these times—as shown, for example, in the increased secretion of synovial fluid—shows that nature makes, as it were, an attempt to establish here what exists in so many of the lower animals. The amount of motion which is thus permitted is, with the exception of the sacro-coccygeal joint, very trifling in normal cases, for were it otherwise the power of locomotion would be seriously interfered with. A certain number of rare instances have, however, been recorded, which suffice to show that the articulations may be relaxed in an unusual degree, and thus a morbid condition ensue. Cases have, indeed, been examined by Morgagni, Hunter, and others, in which the separation between the pubic bones at the symphysis exceeded an inch, and in such cases great increase of the synovial secretion has been observed. The woman complains first of pain and uneasiness, which is aggravated on walking, or even by a trifling movement of the trunk. From being intolerable, locomotion becomes impossible; and, on careful examination of the joints, movement, attended with synovial crepitation, may sometimes be induced. Absolute rest should, as a matter of course, in all such cases, be strictly enjoined, for every movement either of the trunk or lower limbs will increase the morbid mobility, and by accustoming the joints to move, will render a cure, which cannot be looked for till after labor, vastly more tedious. After labor—the severity of which this affection will rather tend to mitigate—a similar course of treatment must be persevered in, to encourage the parts to resume their former condition. This will also be promoted by firm bandaging, and by the use, it may be, of some more rigid mechanical support, several of which have been devised for the purpose. Inflammation of the pelvic articulations is another occurrence which may call for attention, but cases of this affection are so extremely rare that the subject may be passed over.

Locomotion, which is, with few exceptions, somewhat impeded in the last months of pregnancy, may be rendered extremely painful, or at least very uncomfortable, by many of the affections which we have been considering. Cases, for example, of relaxation of the abdominal walls in pluriparæ and the anteversion of the womb which often accompanies it, are often attended with this inconvenience, which, under such circumstances, may be greatly relieved by the use of an abdominal bandage, so adjusted as to support the displaced womb.

VI. *Disorders affecting the Nervous System.*—The extent to which these may be multiplied by classification is almost illimitable. We shall here, however, confine our attention to a few only, leaving the more important of them to be discussed in a future chapter, and passing over such as may be treated on general principles. The functions of each of the organs of special sense may be disturbed during pregnancy, and we may therefore meet with cases of deafness, aversion to certain odors or perfumes which may previously have been deemed agreeable, dimness of vision, and even amaurosis, and, as regards the sense of taste, peculiarities in this respect are among the most familiar accompaniments of the pregnant state. Vertigo, flushings, syncope, and even itching of the skin, in the absence of any cutaneous irritation, must also be referred to the same class. Nor do the moral and intellectual faculties escape, in all cases, without suffering material disturbance. The subject of mental alienation in the puerperal state will hereafter be more fully discussed, but there are minor degrees of aberration, both moral and intellectual, which do not amount to, or even approach insanity, but which are by no means of rare occurrence during gestation. Affection may, in this way, be replaced by unaccountable antipathy, a trusting disposition by jealousy, or a temper which can scarcely be ruffled by wanton irritability. Amusing cases are even narrated, in which an inverse process was the result, and in which whole households learned to hail with pleasure the pregnancy of the lady of the house, which was divulged to them by unwonted gentleness of manner and genial cheerfulness. "It is not uncommon," as Burns says, "to find women very desponding during pregnancy, and much alarmed concerning the issue of their confinement." This affection, which closely resembles a similar state occasionally attendant upon disordered menstruation, amounts, when extreme, to melancholia, and seems, in both cases, to have its origin in an irritation which, starting from the uterus, operates reflexly through the nerves. Cheerful society, and careful attention to the diet and bowels, constitute, along with other similar measures, the only treatment proper to such a case.

Pain, unconnected either with uterine contraction, or with inflammatory action, and referable to any one point in the abdomen, is an occurrence which occasionally, from its severity, calls for interference. In a certain number of such cases, there no doubt is, as Scanzoni points out, an abnormal tenderness of the womb, which many have attributed to rheumatism of that organ, during which either the whole womb, or a limited portion of it, may be the seat of very acute pain. When this is the seat of the pain, it is usually referred to the hypogastric region; but there are many other instances in which pain of an equally acute character is experienced in other regions. Pain in the groins has thus been supposed to be caused by dragging on the round ligaments, which will be best relieved by an abdominal bandage and the horizontal posture. Pain in the lumbar region has, in like manner, although on what ground it is not clearly shown, been attributed to stretching of the broad ligaments. Pain and cramps in the thighs are most distressing accompaniments of pregnancy, and are due, in part, to pressure on the sacral nerves, and in part to a reflex action, starting, most likely, from the uterus, but probably, in some instances, from the bowels. The abdominal walls also seem, in some cases, to be the seat of acute and almost constant pain. This occurs during the last months of pregnancy only, and is generally confined to a limited space on the abdominal surface,—so that it is often difficult to convince the patient that it does not mark the seat of some severe local inflammation. All such painful affections as we have alluded to must be treated, during pregnancy, by the agency of measures which are merely palliative, and, in point of fact, palliation is the most that experience of such cases teaches us to anticipate. Warm baths in all cases, laxatives in the case of cramps, rest and local applications for the relief of the pain, are the only agents which, in most instances, can be employed; for opiates and other anodynes are very generally contraindicated, in so far as their internal administration is concerned. Among external applications may here be mentioned the soap and opium liniment, chloroform with tincture of aconite, and belladonna plasters. In the worst cases, morphia may be resorted to, in the form of suppository or subcutaneous injection, or a small blister over the site of the pain may be kept open, and dressed with the same agent. The increased sensibility of the uterus is, in some of these cases, associated with particularly active fœtal movements; and, very often, pain, which has been relieved or deadened, is again awakened by a sudden movement, a sneeze, or a cough.

VII. *Displacements of the Gravid Uterus.*—Certain displacements or dislocations of the womb, which are of frequent occurrence in the unimpregnated state, exist also, although much more rarely, during pregnancy. The reason of the comparative infrequency is to be found in the fact that, while in all probability impregnation takes place in many instances of uterine displacement, the general effect of the subsequent development of the uterus in the course of pregnancy is to reduce the dislocation, and thus to avert the disastrous consequences of its persistence.

In the affection known as *Prolapsus* or *Procidentia*, conception may occur, and that even in cases where the uterus projects externally. But, while prolapsus frequently precedes impregnation, the details of some cases would seem to show that sometimes the prolapse succeeds the conception, the uterus descending instead of ascending as the development progresses, while the further growth of the organ takes place without its ever rising into the abdominal cavity. Examples of this have been recorded by Portal, and by others whose statements we cannot permit ourselves to call in question. In some of these instances development has gone on entirely within the true pelvis. Up to a certain point, the uterus may no doubt occupy this situation without causing any symptoms of discomfort, and this in fact is what takes place, as we have seen, in the first three months of normal pregnancy. But, should any mechanical impediment prevent its further expansion in the direction of the abdomen, or should any other cause induce its prolonged sojourn in the pelvis, the pressure which is exercised upon the bladder and rectum interferes seriously with their functions, and the case goes on, with great suffering to the patient, until nature relieves herself by expelling prematurely the contents of the womb. Those instances in which it is reported that pregnancy went on uninterruptedly, must, we presume, have been cases in which the cavity of the pelvis presented very unusual dimensions. In some of them the uterus projected partially, but the most extraordinary of all are those in which prolapsus has been complete, the gravid uterus lying in the form of a huge tumor between the thighs of the mother: and, incredible though it may seem, it has been asserted that under such circumstances, pregnancy has reached its normal termination without any special danger either to mother or child. The usual result is that abortion occurs before the end of the fifth month, as in cases narrated by Levret, Capuron, and others. The treatment, in the majority of such cases, will consist mainly in careful attention to the functions of the bladder and rectum, and in watching the progress of the case. When the prolapse has preceded pregnancy, and circumstances point to the possibility of an occurrence such as we are now considering, we should watch the case carefully as the period approaches at which the uterus should rise above the brim, and, if necessary, afford it some aid by careful manipulation, as was done by Scanzoni in two cases. Should the organ appear externally, similar efforts should be made, failing which it must be supported by an external bandage. But, so soon as dangerous symptoms manifest themselves, or the bowels or bladder are so obstructed as to render defecation or micturition impossible, our course of procedure is clearly to act promptly, in such manner as may seem most judicious, with a view to the immediate expulsion of the contents of the uterus, for to allow such a pregnancy to continue would be to compromise the life of the mother as well as that of the child.

Anteversion and Anteflexion.—These forms of displacement are of rare occurrence during the early months of pregnancy. This is what an observation of the anatomical relation which the organ bears to the pelvic walls would have led us to anticipate; and, as Kiwisch has well observed, any such tendency which might exist is obviated further by pressure directed upwards against the fundus by distension of the bladder, and downwards against the vaginal portion by repletion of the rectum. Cases have, however, been occasionally observed, giving rise to symptoms indicating obstruction to the action of the bowels and bladder. The digital examination which such symptoms suggest reveals at once the nature of the case, the cervix being high in the hollow of the sacrum, while the fundus forms a rounded tumor which is felt in the roof of the vagina in the direction of the bladder. In such a case, the patient should be directed to lie on her back as much as possible; and, when the period arrives at which the uterus no longer finds accommodation within the pelvis, the fundus will rise upwards, and will thus spontaneously relieve any uneasiness to which the displacement may have given rise. This is the natural issue of such a case: but it is quite possible that, in some instances, the dislocation may be reduced by careful pressure upwards of the fundus by the finger, but this should only be attempted should the severity of the symptoms warrant any interference. In the later months of pregnancy, anteversion is of much more frequent occurrence, and is then associated with the phenomenon of pendulous abdomen. It is observed almost always in the case of multiparæ, in whom the abdominal walls have been subjected to repeated distension, and in those, it is said, in whom the inclination of the pelvis is greater than usual. In direct proportion to the degree of displacement is the amount of pressure to which the bladder is subjected, and, consequently, the degree of discomfort to which it gives rise by impeding the flow of urine. In some instances, the abdominal wall not only projects forwards, but hangs downwards, and to those cases the term anteflexion is more applicable than anteversion, as the axis of the uterus is then bent in a greater or less degree. In extreme cases, the walls of the abdomen have been observed to hang down as far as the knees, but it seems likely that in most of these there is an actual hernia of the womb, owing to a separation of the recti muscles, between which it protrudes. This form of displacement may, as we shall have occasion hereafter to observe, cause difficulty in the process of parturition, by misdirecting the expulsive force; but, in every case, the treatment is the same, and consists in an endeavor to support the fundus by bandaging, supplying in this way the support which the abdominal wall should afford; and, in addition, attending to the function of the bladder, remembering always that the greater the displacement of the womb, the greater is the corresponding elongation of the bladder. That organ, indeed, in some cases, loses all traces of a spheroidal form, and assumes the shape of an elongated pouch, which is bent over the symphysis, and which, therefore, can only be conveniently emptied by the use of a long elastic catheter.

Retroversion and *Retroflexion* of the gravid uterus are much more dangerous both to mother and child than displacements in the contrary direction. The distinction between the two varieties depends simply, as the names imply, upon whether the long axis of the uterus is bent or straight, and in each the fundus of the uterus occupies more or less completely the recto-vaginal pouch of the peritoneum. We believe, however, that the distinction which is usually drawn between retroversion and retroflexion, whether occurring in the unimpregnated state or during gestation, is more apparent than real. The great majority of cases will be found, in fact, on careful examination, to be neither exactly the one nor the other, but a condition intermediate between the two, in which the axis of the uterus is neither straight, nor abruptly bent at the os internum like the neck of a retort, but forms the arc of a circle, the imaginary centre of which varies very greatly. We shall content ourselves, therefore, with the expression Retroversion, without attempting to draw any formal distinction between the two varieties.

As, in a certain number of cases, impregnation takes place of an ovum contained in a retroverted womb, it is proper to notice here briefly the causes which have been assumed, and to a certain extent have been demonstrated, to lead originally to this displacement. It has been supposed, and we believe with good reason, that there is often an unusual mobility of the uterus in the direction which leads to the displacement we are now considering. This is due to a morbid relaxation and lengthening of the round ligaments and vesico-uterine folds, which thus admit in the first instance of a movement of the fundus backwards, which is encouraged by repletion of the bladder, and still more by overdistension, arising either from carelessness or from any other cause.[1] The effect of the combined action of these two causes is to induce a certain amount of displacement, which other circumstances may tend to aggravate or complete. While the uterus is in its normal position, it is impossible that distension of the rectum can cause retroversion, but so soon as the causes above detailed, or others to be mentioned presently, have acted so far as to press the fundus backwards towards the promontory of the sacrum, then this new force comes into play, the fecal masses, as they descend, gradually forcing the fundus further and further down into the pouch of Douglas, until a marked case of retroversion is the result. The other causes alluded to as auxiliary forces, are the downward pressure exercised by the abdominal viscera, and the existence of fibroid growths in the posterior uterine wall. At any stage of this displacement impregnation is possible, and it is easy to understand how, in such a case, a comparatively slight retroversion may be converted into one in which the fundus fills the hollow of the sacrum, and may actually reach as far down as the coccyx. Before long, however, the limited space within which, in this position of the uterus, the development of that organ goes on, becomes filled, and the pressure upon the bladder and rectum calls immediate attention to the case. An examination discloses the altered anatomical relations of the parts. The os and cervix will generally be found about the level of the subpubic angle, or somewhat above it; while, behind this, and about the same level, a firm rounded tumor is felt, apparently occupying the recto-vaginal pouch, and pressing forwards the posterior wall of the vagina. (Fig. 95.) On examination by the rectum,—into which two fingers are to be passed as high as possible,—the same tumor is felt through its anterior wall, but in this method of observation, considerable difficulty will often be experienced in passing the finger, owing to the great pressure to which the bowel is subjected. Backward displacement of the gravid womb has generally been observed in the third or fourth month of pregnancy, but cases are recorded by Smellie, Bartlett, and others, in which it was observed as late as the fifth or even the seventh month. It is more than likely, however, that, in those instances, what Scanzoni describes as partial retroflexion was mistaken for the complete dislocation of the organ. What has been described as partial retroversion, is rather a peculiarity in the shape of the uterus, when its posterior wall forms a tumor which, owing to some peculiarity in the position of the child, projects into the recto-vaginal pouch, and thus resembles an ordinary case. Assuming that this does actually take place, the occurrence is possible at a much more advanced period of pregnancy, when the development upwards of the remainder of the uterus would probably enable us, without much difficulty, to recognize the nature of the case.

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[1] With a view to the elucidation of this subject, Scanzoni made a series of most interesting observations both in the living and the dead. He found, in the first place, that distension of the bladder always caused a certain amount of displacement backwards of the fundus. "We found," he says, "when we artificially filled the bladder in dead bodies, that the duplicatures of the peritoneum passing from the uterus to the bladder, stretched themselves in direct proportion to the distension of the bladder, so that when the bladder was filled and distended as far as possible, this stretching reached to such an extent that it was impossible, without considerable effort, to force the fundus of the uterus backwards for more than a few lines, as its attachment to the posterior wall of the bladder was much more firm than when that viscus was empty. A very different result ensued when we, in the first instance, cut

Of much more frequent occurrence than that which we have just described, and which we may call the chronic form, is the acute retroversion of pregnancy. In this case, the affection occurs suddenly, but

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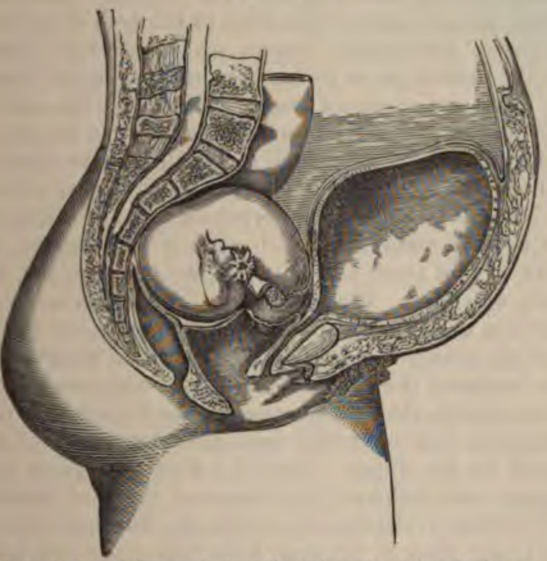
the round ligaments and the peritoneal duplicatures above alluded to, and then filled the bladder. In this case, by a moderate distension, the fundus uteri was strongly displaced backwards, and the vaginal portion forwards, so that it depended upon our will, by the injection of a greater or less quantity of fluid into the bladder, to induce a higher or lower grade of retroversion."—*Lehrbuch der Geburtshilfe.*

it is most likely that there is a pre-existing minor degree of displacement, which gives rise to a further and sudden change in the position of the womb, sufficient to cause complete retroversion. Immediately upon the occurrence of this dislocation, or within a very short period, the woman complains of severe dragging pain, which is accompanied by a new sensation, as of a foreign body in the pelvis. This gives rise to painful and fruitless expulsive efforts, with increase of the pain around the entire pelvis, and great difficulty in emptying the bladder and the rectum. These symptoms are usually attended with faintness, nausea, and vomiting, and other general symptoms of even greater severity; and, unless the reposition of the organ be speedily effected, this state of matters gives rise to complete retention of urine and obstruction of the bowels, which may, in their progress, result in rupture of the bladder, stercoraceous vomiting, ileus, and such symptoms as precede a fatal result. In many cases,—perhaps in most of those in which the incarceration of the organ is prolonged,—there is congestion and thickening of the uterine walls, and this may sometimes amount to actual inflammation of the organ, which becomes exquisitely tender, and thus aggravates greatly the sufferings of the patient.

FIG. 95.



Retroflexion of the womb about the 16th week. (After Shultze.)

The natural termination of a case such as this involves great risk to the mother, and almost certain death to the child. For, although in its further development the womb may possibly take an upward direction, and the symptoms be thus spontaneously relieved (and such cases are on record) the usual result unfortunately is, that the increase of the uterus gives rise to the more serious symptoms above detailed, which can only be relieved by arrest of development, or by expulsion of the fœtus. Nothing can, therefore, be more obvious than the necessity which exists for prompt action in the way of treatment. Should the congestion of the womb be marked, benefit will be derived in the first instance from the use of warm baths and injections, and local or even general bloodletting; and, when these measures have had time to act, attempts are then to be made to effect the reposition of the organ, taking care, of course, in the first place, that the bladder and rectum have been thoroughly emptied.

The woman having been placed in the ordinary midwifery position, with the nates projecting over the edge of the bed, or on her elbows and knees, the index and middle fingers, previously well oiled, are introduced into the rectum, so as to bear against the tumor,[1] and an effort is then to be made, by means of steady pressure in the axis of the brim, to push the fundus beyond the promontory of the sacrum. It will be observed, should it be found possible to displace the fundus to any extent, that the movement takes place not directly towards the promontory, but rather towards the sacro-iliac synchondrosis of either side; and, as we cannot tell beforehand to which side it will incline, although the probabilities are in favor of the right, we must, in the first instance, push directly upwards. But, should the fundus obviously tend to move in the direction of one sacro-iliac joint in preference to the other, the direction of the pressure must then be altered, in order to accommodate itself to the tendency thus exhibited. If the compression of the rectum is such as to prevent the introduction of the fingers to a proper height, Kiwisch suggests that we should substitute the handle of a silver spoon or of a sound for the finger. Should a first attempt at reposition fail, we may pause and endeavor, by means of repeated injections, cold or warm, still further to reduce, if possible, the intumescence of the womb. The patient may then be brought fully under the influence of chloroform, and the attempt renewed in a different posture, when, in many instances, the dislocation will be happily reduced, the womb being occasionally restored to its normal position, as in the case of its inversion, with a snap or jerk. Should difficulty occur in the introduction of the finger into the rectum, it will be proper to make an attempt by the vagina, although in this case, as a little reflection will show, the attempt will be made at a greater mechanical disadvantage than when the rectum is selected. Failing all these methods, we may attempt to dislodge the fundus by the introduction, as high as is possible, into the rectum of an elongated air-bag, such as those invented by Barnes for dilating the os and cervix in inducing premature labor. These bags have a long tube fitted at the end with a stopcock, and through this the injection, either of air or of water, causes a graduated pressure, which acts continuously, and at the same time effectively, upon the displaced fundus, so as gradually to effect its reposition.

All attempts at reduction having failed, the best mode of procedure is to adopt only such measures as are necessary for the relief of the bladder and the rectum, so long as the symptoms are not so severe as to call for immediate action. But should the emptying of the bladder become impossible, or should any other symptom develop itself which may be held to imply that the life of the mother is in imminent danger, there then remains for us no resource but to imitate nature, and to induce, without delay, the premature expulsion of the fœtus. Of the many methods by means of which, as we shall have occasion again to observe, it is possible to induce premature labor, that which is most applicable to the present case is the rupture of the membranes. For the immediate effect, which is thus produced by the sudden evacuation of the liquor amnii, is to reduce the diameter of the uterus, and thus to afford partial relief during the period which intervenes between the operation and the commencement of uterine action. It is, however, by no means an easy matter in every case to effect this rupture, more especially when the os is tilted up behind the symphysis, and is only reached with difficulty, and it may be found necessary on that account to introduce a catheter, with an opening at the extremity, through which a wire may be passed, and having reached the membranes, to thrust the wire through, and thus effect our purpose. But it may happen, unfortunately, that the os is displaced upwards to such an extent that it is impossible to reach it, or at least to pass anything through it; and in such circumstances we have no alternative, if the life of the mother is in obvious danger, but to puncture that portion of the uterine wall which lies lowest, and thus give vent to the amnionic fluid, and afford relief to the patient. It is of course safer, under such circumstances, to puncture from the vagina than from the rectum, but the latter operation has been successfully performed, effusion into the peritoneal cavity having been prevented by leaving the canula *in situ* until the risk of further effusion had passed. The uterus being thus relieved of its fluid contents may now be replaced without much difficulty, unless adhesions should chance to have occurred, and then awakened expulsive effort will speedily relieve the organ of its solid contents. Where reposition of the uterus has been successfully effected, labor may go on without any further accident or hindrance, but in some few instances it would seem that a tendency to relapse remains. This must, therefore, be guarded against, by insisting upon strict rest on the side, and, by the frequent use of the catheter and enemata, to prevent such mechanical pressure from the bladder and rectum as might encourage a recurrence of the displacement.

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[1] Scanzoni recommends that the thumb of the same hand should be introduced into the vagina, mainly with the object of elevating the perineum, and thus allowing the examining fingers to pass higher.

Oblique displacements of the uterus have been insisted upon by some writers as exercising an important influence on the progress of pregnancy. We know already that the long axis of the gravid uterus does not correspond with the middle line of the body. It is quite possible, therefore, that when this normal obliquity is exaggerated, the os may, for a time, be prevented from dilating by the altered axis of the expulsive force. Such displacements, however, seem to have had their origin, in a great measure, in the imagination of those who have sought to reduce the art of midwifery to a series of geometrical propositions, and are certainly not of sufficient practical importance to require more particular attention.

In addition to the diseases of pregnancy which we have described, there are others, chiefly constitutional, which exist both during and after labor, the consideration of which we shall, therefore, in the meantime defer.

CHAPTER XV.

LABOR AND ITS PHENOMENA.

CAUSES OF LABOR—MATURITY: ANTAGONISM BETWEEN CERTAIN GROUPS OF UTERINE FIBRES: BROWN-SÉQUARD'S THEORY: LABOR COINCIDENT WITH THE TENTH MENSTRUAL PERIOD—FORCES BY WHICH DELIVERY IS EFFECTED: NERVI-MOTOR FUNCTIONS OF THE UTERUS: EFFECT OF EMOTIONAL CAUSES: REFLEX FUNCTION OF THE SPINAL CORD: PERISTALTIC ACTION: AUXILIARY FORCE IN THE MUSCLES OF EXPIRATION—STAGES OF LABOR—PREPARATORY STAGE—FIRST STAGE: LABOR PAINS; THEIR EFFECTS ON THE MATERNAL PULSE AND ON THE UTERINE SOUFFLE: FALSE PAINS: MECHANISM OF THE DILATATION OF THE OS; THE BAG OF WATERS: EFFECT OF LONGITUDINAL FIBRES: TERMINATION OF FIRST STAGE IN RUPTURE OF MEMBRANES: RIGOR: SHOW—SECOND STAGE: CHANGE IN CHARACTER OF THE PAINS: THE "CAPUT SUCCEDANEUM:" ACTION OF VOLUNTARY MUSCLES: DILATATION OF THE PERINEUM: BIRTH OF THE HEAD AND TRUNK—THIRD STAGE: "DOLORES CRUENTI:" SEPARATION AND EXPULSION OF THE PLACENTA; MECHANISM OF THIS.

THE first point which, in considering the subject of Labor, attracts our notice, is one which has given rise to many interesting physiological speculations. We refer to the causes which lead to the occurrence of delivery, in almost all cases in which the course of pregnancy is undisturbed, at a certain fixed period, calculated from the assumed date of conception. In ancient times, the idea prevailed that the fœtus was itself the principal agent in effecting its birth, breaking the membranes, and opening up the womb in its efforts to reach the external world, after the same fashion as the chick when escaping from the thraldom of the egg. The advance of physiological science generally, and more especially the discovery and demonstration of the contractility and muscular structure of the uterus, while they showed clearly enough how erroneous this opinion of the ancients was, did not disclose, and as yet have not clearly revealed, what is the determining cause of uterine contractions at the period alluded to. There exists, say some, a natural antagonism between the muscular fibres of the body of the uterus and those of the cervix; and, so long as the obliteration of the cervix is not effected by the progress of development during the last two months, the tonic contraction of the fibres of the body are not sufficient to overcome the resistance offered by the cervix. But, so soon as the process of dilatation has entirely invaded the cervix, a change which is only complete with the termination of pregnancy, the fibres of the body for the first time prevail, and the contractions, assuming a periodical method of action, gradually increase in intensity until they result in real labor pains. Others, and among them Dubois, recognizing the exact analogy which subsists, in regard to the distribution of muscular fibres and nerves, between the uterus and the other hollow viscera, and assuming that in the uterus, as in the rectum and bladder, contraction may be awakened by irritation of the cervix (to which alone, as we have already seen, the nerves of animal life have access), believe that in these facts the secret is revealed. They hold that the complete obliteration of the cervix involves the highest grade of physiological development to which its fibres can attain, and that the sphincter fibres are then for the first time fully susceptible of external influences, communicated to them through cerebro-spinal nerves. And they conclude that, in this manner, the first excitation reaches the fibres of the cervix, and thus contraction of the whole organ ensues.

A most ingenious theory is one which has been founded by M. Brown-Séquard on the result of certain experiments which he performed by tying the trachea of pregnant animals, in whom he had previously destroyed the lower portion of the spinal cord. The immediate result of the apnœa thus artificially induced, was the occurrence of uterine contractions, which disappeared on relaxing the ligature, and returned again on repeating the experiment. This is due, says the experimenter, to the contact of venous blood with the muscular fibres, the irritability of which is highly exalted during pregnancy. He explains the earliest uterine contractions on the same principle. The large size of the uterine sinuses insures the presence in the substance of the uterus of a large quantity of venous blood, and so soon as the muscular fibre reaches, at the termination of pregnancy, its highest point both of irritability and of development, it becomes for the first time excited to contraction. The immediate result of this is to empty, in a great measure, the sinuses of blood, but so soon as the rhythmical relaxation occurs, the venous blood again gains access to the irritable fibres, and anew excites them to contraction.

Whatever view we may be inclined to assume in reference to the cause of labor, there can be no doubt that it is coincident with the maturity of the fœtus. Gradual relaxation of the anatomical connections between the uterus and the ovum, is another undoubted phenomenon which immediately precedes birth, and it was in this that Simpson believed the determining cause to reside. And, finally, Dr. Tyler Smith has suggested, and argues with great ability in favor of the theory, that the cause of labor is to be found in the ovary. "It is allowed by all observers," says Dr. Smith, "that labor has a tendency to occur, and does occur, in a great proportion of cases, in the fortieth week from the last menstruation; and it is equally allowed that impregnation is generally effected just after the catamenial period. It is also made out by the record of a considerable number of cases in which a single coitus occurred, that gestation lasts, on an average, about 275 days from the actual date of impregnation. These dates make the average duration of pregnancy approach 280 days from the last catamenial period, and the occurrence of parturition is, on the average, very nearly a multiple of a single catamenial period." We confess that the arguments which this author advances in support of his theory, seem to us in a great measure to warrant the conclusion at which he has arrived. But, while we admit that it is in the highest degree probable that a presiding influence springs from the ovary at the period of the natural menstrual molimen, we by no means wish to commit ourselves to the opinion that it is the sole cause. All analogy leads us to conclude that maturity must exercise no unimportant influence; and there is perhaps no one of the theories which have been mentioned, in regard to which we would venture to say that it involved an impossibility, and we must therefore be content to leave the subject as we find it,—one in regard to which there is still room for speculation.

Whatever we may assume the cause of labor to be, the immediate effect of its operation is to rouse the latent energy of certain Forces, by means of whose active co-operation the delivery of the woman is effected. The prime force, to which the others are merely subsidiary, is, as we well know, the contraction of the muscular fibres of which the uterus is, to such a large extent, composed. That these contractions are of very considerable power, is proved, not merely by the resultant of the force, as shown in the expulsion of the fœtus, but also palpably to the senses by the contraction which may be seen and felt through the abdominal walls, and by the effect which is produced on the hand when introduced into the uterine cavity. Dr. Matthews Duncan has computed this force as equivalent to a pressure of 3 lbs. on the square inch.

In considering the Nervi-motor functions of the uterus, we observe, in the first place, that volition exercises no direct influence whatever on the contraction of the uterine muscular fibre; although, as we shall see, it presides over what will be afterwards described as the auxiliary forces. In cases of cerebral paralysis, and when the action of the will has been completely suspended by chloroform, we find that uterine contractions are quite undisturbed. Nay, stranger still, we know that, in some instances, contractions may occur after death, giving rise to post-mortem delivery. There are cases, at least, in which this phenomenon is due to actual contraction of the fibres; but we must be careful to draw a distinction between those and cases of expulsion, which have occurred some days after death, and which have been found to be due either to *rigor mortis*, or to pressure from the development of gas in the process of putrefaction,—a condition which gives rise to many other strange phenomena which are familiar to the student of medical jurisprudence.

Certain emotional causes produce an effect on the uterine contractions which it is not easy to account for. Few occurrences are more familiar to the accoucheur than the effect which his arrival frequently produces upon the progress of labor, by causing a complete temporary cessation of all uterine effort. On the other hand, sudden mental emotion of any kind may, by augmenting the force and frequency of the expulsive action, sometimes influence the progress of labor in a marked degree; and this has been observed to occur upon the threat of using instruments, or upon the exhibition of the forceps. Causes, then, which, being psychical, have their origin in the cerebrum, may act either by increasing or by arresting uterine effort.

The spinal marrow exercises upon the uterus a very obvious and important influence. There is, in the first place, a direct or centric action, in which the motor nerves are excited by a communication starting from the nervous centre; and it is in this way that ergot and other oxytoxics act, being conveyed to the cord by the circulation, and there producing an effect which is transmitted to the uterus, where it takes the form of muscular action. In this manner, too, many diseased conditions of the blood produce an effect, as is well known, by acting on the cord, and giving rise to different varieties of puerperal eclampsia; and in this way even plethora, or anæmia, may exercise an influence on the dynamic force of the womb. But of much greater importance, and of higher physiological interest, is the diastaltic, or reflex function of the cord, which chiefly presides over the motor functions of the uterus, and which is associated, more or less directly, with the physiological actions and pathological changes of the latter. One of the most familiar instances of this is the uterine contraction which ensues upon the irritation of the nipple by the contact of the child. The impression is, in this case, conducted to the spinal centre, and being thence reflected to the uterus, forthwith acts upon its contractile fibres: and, so constant is this occurrence, that it is admitted in practice as a valid reason for putting the child to the breast at an early period after delivery. A similar effect may be produced, although with less certainty, by an irritation of a similar kind starting from the stomach, rectum, or any other part of the alimentary canal; from the ovary, or from any structure in the immediate vicinity of the uterus; and, finally, from the direct irritation of the organ itself, which may be effected in various ways, the most reliable of which is irritation of the os and cervix, or of the internal surface in the case of hemorrhage. The very extensive nervous sympathy which thus exists between the uterus and so many distant parts shows pretty clearly that its nervous functions are, during pregnancy and the puerperal state, greatly increased. What is known, up to the present time, in reference to the uterine nerves, is by no means very satisfactory; but the result of most modern investigations in regard to these nerves, which are only to be traced with the greatest difficulty, seems to confirm the view originally adopted by Dr. R. Lee, that they undergo, during pregnancy, considerable enlargement,—an enlargement, however, which appears to have its seat mainly in the neurilemma. This subject is one which has given rise to a deal of acrimonious discussion, and is still beset with many difficulties which have only partially been overcome. It was stated in a former chapter that twigs of the sacral nerves, passing to the os and cervix, constitute the channel of communication between the cord and the uterus, but that the rest of the nerves are derived from the ganglionic system. When, therefore, nervous force is reflected upon the uterus from the cord, it passes by the nerves in question, and reaches, in the first instance, the cervix and os. In this situation plexuses are found, to the formation of which the spinal and ganglionic systems contribute, and through these the force is transmitted to the terminal fibres in the body of the organ, where it excites immediate and effective uterine contraction.

It is well known that the hollow viscera, which are supplied in whole or in part by the ganglionic nerves, contract, when irritated, after a fashion peculiar to such structures. The contraction, instead of being limited to the immediate vicinity of the point of irritation, is propagated in a definite direction in rhythmical waves, successive groups of fibres being thus excited so as to constitute the phenomenon commonly known as peristaltic action. The uterus forms no exception to this general law, and its peristaltic or ganglionic motor action was observed and described by Harvey and William Hunter, and by every physiologist of note since their day. The manner in which peristaltic uterine action occurs is, as Wigand has taught, in so far as the contractions of labor are concerned, as follows: The earliest contractions always take place at the neck, which grows tense. From this point, the vermicular action extends gradually upwards in the direction of the fundus, from whence it again returns towards the os, obvious mechanical advantages, of which we shall speak presently, being attendant upon this method of action. Uterine expulsive action is thus a composite force, which is partly diastaltic and partly peristaltic. Physiologists have sought, by many ingenious experiments on the lower animals, to ascertain what is the precise share which is to be attributed to the reflex function of the spinal cord in producing the phenomena of labor. These experiments have usually taken the form of section of the spinal cord at a certain level, or destruction of the lower part of the cord; and it has been found that the latter procedure has produced the most decided effect in arresting uterine action. In most of these cases, however, it would seem that the peristaltic action remained, and that there was still sufficient expulsive force left to effect delivery. In some cases, it would almost seem as if destruction of the lower part of the cord put an end to all uterine action, but there are obvious sources of fallacy connected with such a method of investigation which render it necessary to exercise great caution before coming to a positive conclusion. It is, indeed, a very difficult question, and one which still remains for solution, whether or not, all connection with the nervous system of animal life being cut off, peristaltic contraction remains possible; for it must not be forgotten that, however thoroughly we may destroy the lower half of the spinal cord, there still remains, in the connections which subsist between the sympathetic system and the upper part of the cord, a possible, though circuitous route, through which the important influence of the cord may still, although more feebly, be exercised.

In making the assertion that the will has no influence directly upon the contraction of the womb, we must not be understood as implying that the will exercises no influence on the progress of labor. For we shall see immediately that there is a stage of labor at which the voluntary muscles are brought into play as an auxiliary force, and that the woman instinctively avails herself of their aid. The diaphragm and the abdominal muscles are the chief agents of this new power, and everything therefore which gives a fixed point for the efficient action of these muscles, indirectly gives great assistance in the progress of labor. It is this which causes a woman instinctively to arrest respiration, in order to admit of the efficient action of the diaphragm, and for the same reason she will eagerly employ the means which are afforded her, by towels tied to the bedpost, or footstools in the bed, to fix the trunk, so as to bring the whole power of the expiratory muscles into play. A minor degree of voluntary expulsive effort, which is in all respects similar, is that which attends difficult defecation. Haller attributed to the abdominal muscles the chief share of the expulsive efforts, but that this is obviously wrong is shown by the fact that in feeble women, in whom the voluntary muscular system is very poorly developed, the delivery is not only effected as easily as in others, but actually, in many instances, with greater ease; and, moreover, complete anæsthesia, which has a most marked effect on the voluntary muscles, scarcely effects in any marked degree the progress of delivery. Another auxiliary force exists, in an advanced stage of labor, in the action of the muscles which constitute the floor of the pelvis, and in the contraction of the muscular fibres which enter into the composition of the vaginal walls. In the lower animals, as is well known, the comparatively feeble contractile efforts of the uterine cornua bring the young successively to the os uteri, when, powerful and violent propulsive efforts being awakened in the vagina, they are promptly expelled. In those animals, therefore, we may look upon the vagina rather than the uterus as the great organ of parturition. What occurs in the human species is precisely similar, only that here the vaginal contraction is subordinate to the uterine, while in rabbits and such-like the converse is the case. That the vaginal expulsive force is by no means inconsiderable is shown by the manner in which the placenta is expelled, and still more, by what involves a more powerful muscular effort—the expulsion of the head in cases of presentation of the breech. In regard to the share which is taken by the muscles at the floor of the pelvis, this, too, is in all probability considerable, and constitutes, no doubt, the "reflected force" of which Solayrés de Renhac speaks in his admirable essay.

The Stages of Labor.—Writers, in considering the physiological phenomena of labor, have uniformly adopted the plan of dividing its progress into various stages. Some have multiplied these stages to an extent which is absurd, as the subject is thus rendered more perplexing instead of being made easy of comprehension to the student. The familiar classification of Désormeaux, according to which labor is divided into three stages, is that which is adopted here.

1st. From the beginning of labor until complete dilatation of the os uteri is effected.

2d. From full dilatation of the os till the birth of the child.

3d. The separation and expulsion of the placenta.

In considering the First Stage of labor, some little difficulty is experienced in determining the exact moment from which labor is to be dated. Long before symptoms of actual labor manifest themselves, certain preliminary processes are gone through, and to this some writers have with much propriety attached the name of the Preparatory Stage. The falling down of the womb, which occurs in the last weeks of pregnancy, may be mentioned as perhaps the earliest of those changes. This, as has already been stated, is usually attended with a marked relief of such symptoms as arise from pressure upwards; but these are often replaced by such as are the result of pressure in the contrary direction, so that dysuria and irritation of the lower bowel become very common symptoms. If an examination is made at this period, the head will be found to have descended in the pelvis, and the condition of the os characteristic of the stage of pregnancy will at the same time be disclosed. The ligaments also of the pelvis become more relaxed and elastic, and the articulations somewhat less firm. The first contractions of the womb at the commencement of labor are either painless, or accompanied with discomfort so slight, as scarcely to attract the attention of the patient. Even thus early, however, the contractions may be perceived by the hand of the accoucheur, if he make an examination through the abdominal walls; and they are often accompanied with such an amount of pain as to lead a woman who has previously borne children to look for the speedy occurrence of labor. It is by no means a rare occurrence for this class of pains to recur again and again, night after night, keeping the patient in a constant state of expectancy and apprehension. Usually, however, the period soon arrives when the pains become more severe, and return at regular periodical intervals, when the contractions, as observed through the abdominal walls, will be found to be much firmer than those of the earlier period.

A pain in midwifery is used as synonymous with the expression "contraction," the one symptom depending directly upon the other. When, at the commencement of labor, the uterus is thrown into contraction, the cervix being, as we have seen, first affected, and then the fundus, the muscular fibres, after remaining in a state of contraction for a brief period, relax,—as is invariably the case in non-striated muscle, it being incapable of sustained effort. During the whole period of a healthy labor, therefore, pain and pause alternate, the former being at first of short duration, and coming on at long intervals; but, as the case progresses, the pains become longer and more severe, and the pauses shorter and shorter, until, at the final effort, one pain succeeds another with such violence and rapidity that the periods of rest or pause are almost obliterated. When a pain comes on, it may in many cases be observed that the fundus, which is usually displaced towards the right side, moves towards the middle line, so as to bring the expulsive force to act in the direction in which it can be most efficiently employed. If we, at this stage, make a vaginal examination, we find, in primiparæ, that the os and cervix are so far obliterated, that the margin of the former is a thin, circular, and almost membranous ring, which represents that portion of the uterus. Against this apparently unyielding ring, the membranes are firmly pressed during the continuance of a pain, and as the amnionic fluid necessarily takes the direction in which there is least resistance, it is found that at this moment the difficulty of reaching the presenting part is increased by the augmentation in the quantity of the imposed stratum of liquid, and by the tension to which this gives rise. Soon, however, the rigid margin becomes softer and more tumid, a condition which, in pluriparæ, exists from the first, and the os yields slowly under the influence of successive pains, so that we are able during the intervals of perfect rest to hook the finger into the os, and to feel distinctly the presenting part.

It is interesting to observe the effect which is produced on the mother's pulse by the occurrence of a pain. If, placing a finger upon it, we note during an interval of rest the number of beats, and continue the observation, we shall find that, with the commencement of the pain, its frequency is increased, and that, continuing to rise, it attains its maximum along with the pain; while with the subsidence of the latter the pulse falls, and on its complete cessation is found to have fallen to its original rate. This observation, as Hohl points out, may be usefully employed as a test to gauge the efficiency of the pains, for the more marked and rhythmical this variation of the pulse, the more effective is the pain which it at once accompanies and indicates. "When, however," he says, "the rapidity of the beats subsides before approaching the maximum, the pain is too weak; or when the rapidity rises by sudden starts, the pain is a hurried one, and in either case its effect will be imperfect." He assumes that, in an efficient pain of average duration, the increase and diminution of the pulse for each quarter of a minute may be put down as follows:

18. 18. 20. 22 : 24. 24. 22. 18.

It would thus appear that the frequency of the maternal pulse attains its maximum during the first half of the second minute; but it must be understood, in making observations based upon this, that it applies to average pains only, and that towards the termination of labor, when the systemic excitement is intense, the pulse from that cause is often so accelerated that any observation of the kind is impossible. If auscultation be practiced during the pains, we often find that the fœtal pulsations are somewhat accelerated, but the effect of a pain tends rather to obstruct than to facilitate the observation of the fœtal heart. The uterine souffle, however, undergoes, almost invariably, marked modifications. The situation having been ascertained at which that sound may most distinctly be made out, auscultation is sustained during the continuance of a pain, or of a succession of pains, when the following modifications are observed. The approach of a pain is heralded by a rushing sound, which may indicate muscular action, movement of the amnionic fluid, or movement of the child. Along with this there is a marked increase in the distinctness of the souffle, which is raised in tone and in pitch, and may even become vibrating or musical. Up to a certain point this increases in intensity; but as the pain approaches its acme, the sound becomes as it were more and more distant, and then —when the moment of greatest contraction is attained—very faint or altogether inaudible; while, as the pain goes off, it passes again through those changes in an inverted order, until the tone proper to the period of rest is restored.

We must be prepared in every case for the occurrence of what are called False Pains, in which, although there may be uterine contraction, it is not of a proper kind. The pain in such cases may be severe enough, but it is spasmodic and variable in character, and instead of beginning in the cervix and extending upwards, as in a true labor pain, it commences usually in the fundus or body, and is attended with no symptoms indicating progress towards delivery. These pains, which are referred to the region of the fundus, and not to the loins, as in normal labor, probably depend upon some irritation, which has its origin in a large proportion of cases in some derangement of the digestive system. The leading characteristics, then, of what, for the sake of distinction, we call True Labor Pains, are uterine contractions, which commence at the os, and thereby prevent, by its early constriction, the descent of the umbilical cord, or of parts of the fœtus which might impede delivery. These contractions are accompanied with pains, which may begin in front and pass round to the sacrum, but which are generally referred mainly to the lumbar and sacral regions.

From an early stage of labor, the tissues are prepared for their new function by a profuse secretion from the vagina and cervix of a thick, colorless mucus, while the parts from which it flows become softer and more cushiony. This discharge, which is occasionally tinged with blood, is frequently mixed with little semisolid albuminous masses, and is very obviously provided by nature for the purpose of lubricating the parts, and thus facilitating the progress of the fœtus along the canal through which it has to pass. Upon the quantity of this discharge the ease of the labor undoubtedly depends in no small degree, not because of its lubricating action alone, but because its appearance involves a softening and general preparedness of the tissues, which is dependent upon the unloading of the congested vessels. There is no sign upon which, as indicating the probable duration of a case of labor, the accoucheur looks with more confidence than this; and from a copious secretion and relaxed condition of the parts, he augurs an easy and speedy labor, while from a dry, constricted, and rigid vagina, he learns that in all probability a lingering, exhausting labor will lead to a tardy delivery.

The phenomenon which essentially attaches to that stage of labor which we are now considering, is the dilatation of the os and cervix, and it has, on that account, been called by some the "stage of dilatation." From what has already been said with reference to the nature of uterine contraction, it must be evident that the effect of each individual pain, when efficient, must be to contribute to the opening or dilatation of the os. And, further, it must be obvious that, while the membranes are intact, the presenting part of the child can play but a trifling part in the mechanism of this dilatation. The more attention we give to this subject the more must we admire the admirable adaptation of means to an end which nature has in this instance adopted, where the object is, as we must remember, not only the expulsion of a solid body through a certain channel, the integrity of which must be preserved, but its expulsion in such a way as may least endanger its independent vitality. It is for that purpose, doubtless, that the membranes are thus preserved.

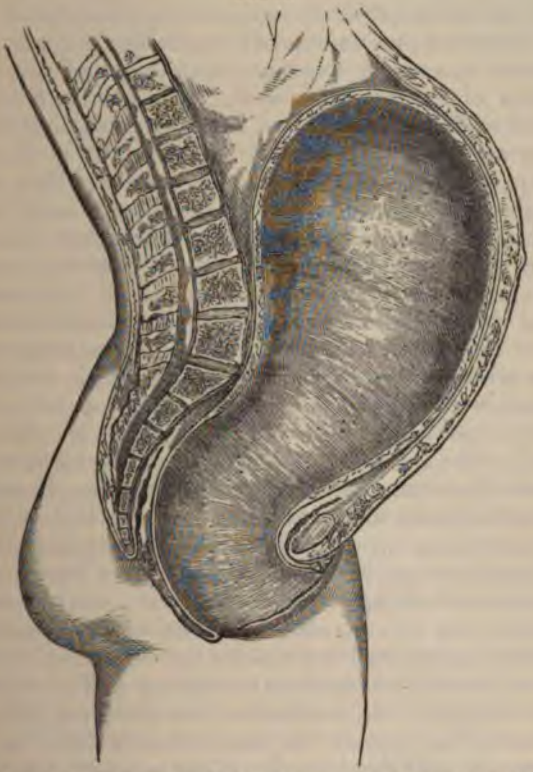
The first efficient contraction having resulted in an opening of the os to a trifling extent, and the tissues being sufficiently relaxed to admit of satisfactory progress, we are enabled to trace the process of dilatation through all its subsequent stages. So soon as the os has yielded to a certain extent, the membranes, which are here separated from their uterine attachment, commence to protrude in the form, first of a watch-glass, and then of the extremity of a pouch or bag, which has been termed the "bag of waters." Following the operation of a very obvious law already alluded to, this phenomenon implies, primarily, an attempt, consequent on the uterine contraction, on the part of the waters, to escape in the direction in which resistance is least. The special function, however, of this bag is to effect the further dilatation of the os, and we can conceive no means which could be more admirably adapted to this object than the graduated fluid pressure which is thus brought to bear upon the os equally in its whole circumference. It constitutes, in fact, in its action during a pain, a hydrodynamic force, which acts at once safely and powerfully upon the whole of the os. But another effect of this action is of even higher physiological interest, for in it we observe a means by which the head of the child is protected from all pressure during the first stage. If we make an examination, in the interval between the pains, when the os is moderately dilated, we can generally feel quite distinctly, through the membranes, the head, or other presenting part, and are able to distinguish, for example, without any difficulty, the different sutures and fontanelles. A pain then comes on; but, instead of the head being driven downwards against the still rigid os, it recedes, and the bag of waters takes its place in effecting that dilatation which, when premature rupture of the membranes occurs, must of necessity be performed by the head itself. And the result, when that occurs, is, as every one knows, protracted labor and increased risk to the child. As the termination of the first stage approaches, the protrusion of the bag of the membranes becomes more and more marked; and as, at the same time, the pains usually become more violent, it often excites our astonishment that rupture is so long delayed, and we look for the occurrence at every pain. The bag by this time forms in the vagina a tumor of considerable size, and, in some cases, where the membranes are unusually resistant, this tumor completely fills the vagina, and even protrudes externally,—a condition which, as we shall have occasion afterwards to notice, constitutes an occasional impediment to delivery. In such cases, the bag of waters, having performed the duty for which it was designed, is no longer of any use, and may, under ordinary circumstances, be ruptured without hesitation.

This purely mechanical force, although we believe it to be the chief, is certainly not the only one which is brought to bear in the course of the process of dilatation. For we cannot doubt that it is powerfully assisted by the contraction of the longitudinal fibres of the uterus, which tend to drag the margin of the os upward at the same time that the fluid is being forced downwards, and some have gone so far as to believe that it is mainly by their agency that the dilatation of the os is effected. Without crediting this latter assumption, we may look upon these longitudinal fibres as antagonistic, in their action, to the circular fibres which surround the os, and thus form a sort of sphincter. While we admit such an action as this, we must not overlook the fact, which has already been demonstrated, that the arrangement of the uterine muscular fibres is extremely irregular. Were the number of longitudinal fibres which are directed towards the cervix greater, and were the arrangement of a circular sphincter more distinct, we might more readily accept this as the main dilating power, but knowing what we do of the irregularity of these structures, we can only accept of it as a subsidiary force. There is yet another method by which, according to some, the dilatation of the os may be aided. It is assumed by those who hold the view alluded to, that there is, in addition to the forces above mentioned, an active dilating power which is resident in the os itself,—a power which acts, not only by opening the os, but also by closing it, as has often been observed in retained placenta, and in inversion of the uterus. We confess, however, that we cannot consider as satisfactory the evidence which has hitherto been offered in support of this theory. In cases in which rupture of the membranes precedes dilatation of the os, the mechanism of the act is quite different, as in that case the walls of the uterus are brought to bear directly against the surface of the fœtus, the head being forced, at each pain, against the circumference of the os, which, at some risk, and by a slower process, is thereby dilated.

A very frequent occurrence on the termination of the first stage is a Rigor. This is a symptom which might very naturally excite alarm in the mind of a young practitioner, more especially as it is sometimes so violent as to shake the bed on which the patient lies. It is, however, attended with no diminution of temperature, nor is it in any way affected by the application of warmth to the surface. This rigor is in fact a phenomenon purely physiological, and is similar to what is observed upon dilatation of the other sphincters of the body, a familiar example of which is afforded in the shudder which sometimes passes over the body during the act of micturition. Another familiar symptom is the slight discharge of blood which at this moment frequently occurs, the ordinary discharge being mixed, or at least streaked, with blood which proceeds from the rupture of small vessels in the os consequent upon its extreme distension. This is what midwives call a Show. But the crowning act of the first stage is rupture of the membranes, which usually occurs at the height of a pain, and is accompanied with a sudden gush of liquor amnii, usually propelled with considerable force, and with a sound which is quite audible to the attendants. If this gush of waters coincides, as it usually does, with complete dilatation of the os, it marks the termination of the first stage. Complete dilatation of the os must not be held at this stage to imply that obliteration of it which converts the parturient canal from the fundus uteri to the ostium vaginæ into a continuous tube, as shown in the figure which follows, for it is not till the second stage has well advanced that such an amount of dilatation is effected. Full dilatation at the termination of the first stage means merely such as will permit of the further progress of the head.

The pains which accompany the first stage are of a character peculiar to themselves, and are of a more teasing, worrying, and wearing nature than the more severe agony which subsequently occurs. The chief annoyance that the woman feels is from the fact that she fancies she is making no progress, and the stage is, therefore, often to her wearisome and tedious in the extreme. She questions her attendants again and again as to the probable duration of her suffering, but this is a point in regard to which we may be specially cautious in risking an opinion. Nothing is so likely to mislead us in this respect as the apparent intensity of the pain. For not only do certain women bear pain better than others, but the same degree of uterine contraction may, in individuals of different nervous susceptibility, produce a very different amount of actual suffering. The intensity of the pain, therefore, is not always in proportion to the degree of contraction, and still less is it to be held as a safe indication of its efficacy.

Fig. 96.



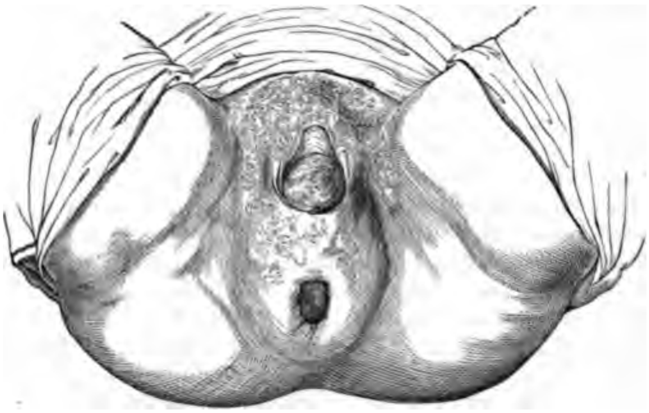
Parturient canal completed by the obliteration of the os and cervix.

The duration of the first stage varies exceedingly, both in primiparæ, and in those who have had several children. Considerable difficulty of determining this point arises also from the impossibility of fixing the exact period of its commencement. With ordinary pains, and a normal condition of the parts, full dilatation will be effected on an average in about six hours, the time in primiparæ being somewhat longer than in other women; but the stage may nevertheless last in any case for one hour only, or for twenty-four, without the occurrence of a single symptom to cause us the least anxiety. It has been frequently observed by the most experienced accoucheurs that, in those cases in which the first stage is tedious, the subsequent stages proceed with unusual rapidity. Sometimes, cases in which there is unusual rigidity of the neck of the womb come to an unexpected and rapid termination in consequence either of rupture of tissue or of sudden relaxation of the sphincter fibres.

The Second Stage.—Upon the termination of the first stage, the uterus gathers itself for further effort by tonic contraction around the body of the child. The pains now undergo a remarkable change. Not only do they continue to increase in frequency, duration, and severity, but the whole character of the pain is altered. The woman has now a consciousness of a solid body which has to be expelled, and she therefore brings to bear upon it, half-involuntarily, the action of all such voluntary muscles as she has at command. The contractions, at the same time, although actually more severe, are much more easily borne,—and apparently for this reason, that the woman is now conscious that progress is being made. These are well termed "bearing down," or expulsive pains, and this stage has therefore been described by some writers as the Propulsive stage of labor. Considerable resistance may still be offered by the os uteri, when rigid, to the advance of the head, and, if so, an œdematous swelling, which is limited in its circumference by the pressure of the os, forms on the presenting portion of the scalp, and may attain a considerable development. This is called the "*caput succedaneum.*" The anterior lip of the os may also become œdematous, in consequence of pressure between the advancing head and the pubis: but, as a rule, it slips up after a time, and the canal then becomes, for the first time, a continuous one. But it is usually not until the head has escaped from the embrace of the os, that the caput succedaneum forms, and we now find that when the head is forced down during a pain, the sutures overlap each other considerably, their situation being then indicated by a furrowed or wrinkled line on the scalp. The whole auxiliary force, formerly alluded to as residing in the abdominal and other muscles of expiration, now comes into play, and it is a wise provision of nature that, however low the head may stand in the pelvis, this seldom occurs until the dilatation of the os is complete; for we may be pretty sure that, were it otherwise, laceration would be of frequent occurrence. Every means which may in this way strengthen the expulsive effort is instinctively adopted. The respiration is arrested, the limbs are fixed, and the woman presents the appearance of one who is undergoing a powerful struggle of muscular strength and energy. The sound of the cry which she emits is also indicative of violent effort; indeed, so characteristic is this, that it is narrated of an old French accoucheur, that when he went to sleep while attending an accouchement, he was always aroused from his slumbers by the altered nature of the patient's voice to a sense of his impending duties. The muscles of the floor of the pelvis, and the muscular fibres which enter into the composition of the vagina, aid, still further, the propulsive effort; while the expiratory muscles are stimulated to redoubled energy, by a reflex action starting from the sensory nerves of the vagina. There is every reason to believe, moreover, that the pressure exercised upon the uterus by the abdominal muscles, constantly increasing as the overdistension of their fibres is reduced, is a supplementary cause of the propulsive vigor of the uterus, which is, by the contraction of the former, more actively stimulated. Violent, however, as the propulsive efforts are, they are not attended with that danger to the integrity of the parts which might, perhaps, have been expected ; for so soon as they reach such a point as would seem to endanger the latter, "the short gasp or cry is," as Tyler Smith says, "exchanged for a cry which dilates the glottis, and the pain and contraction subside. This cry is a motor action, excited by the emotion of pain, and instantly relieves the uterus of all extra-uterine pressure. Thus, the glottis may be compared to a safety-valve, which is thrown open by emotion whenever the pressure becomes more than can be borne with safety." The presenting part, which now approaches the outlet of the vagina, soon presses directly upon the perineum, which bulges downwards ; and, at the height of a pain, when this bulging is most marked, that part of the child which is to be first born, presents itself at the vulva. This is admirably shown in the accompanying engraving. The rectum now becomes flattened, and the sphincter dilated, so that any fecal matter which may have been lodging there is unavoidably expelled. The margins of the anus being dragged apart, the anterior wall of the rectum thus becomes, as it were, a temporary portion of the perineum, as is shown in the figure, while the perineum itself becomes more and more distended, for which modification, indeed, its structure and the nature of the attachment of its muscles admirably adapt it. The hæmorrhoidal veins are frequently much distended, and the dilatation of the perineum goes on both longitudinally and transversely, in a progressive manner, proportionally to the violence of each pain, with which the perineum projects as far as is safe ; while, on the subsidence of the pain, the elasticity of the perineal structures causes the head again to recede.

Alternately advancing and retiring in this way, but always gaining ground, the head ultimately passes the distended aperture in a direction forwards, under the pubic arch, the perineum now presenting the appearance of a thickened membrane. In many cases, the head is arrested by the cessation of a pain, just at the moment when its greatest diameter is encircled by the circumference of the vulva, but it does not now recede. This has been called the stage of "crowning," and may be looked upon as favorable to the integrity of the soft tissues. A final pain now brings the presenting part into the world, and this period which immediately precedes delivery is that at which the suffering of the woman reaches its highest pitch,—sometimes amounting to frenzy, —and it is wisely and mercifully provided, in some codes of jurisprudence, that any act of violence committed at this moment is viewed with special leniency. Upon the birth of the head, the woman enjoys a brief interval of relief, but, the pains soon return, and complete the delivery of the remainder of the child. The external parts, which have become contracted around the neck upon the passage of the head, are again dilated, and the shoulders are expelled. It will be found, however, that it is not invariably the anterior shoulder, as is stated in many works, which is first expelled; for, in a very considerable number of instances, that shoulder which lies towards the perineum takes precedence in its passage into the world. During this stage, a certain amount of laceration generally takes place, in the direction of the distended perineum, and in primiparæ, indeed, the fourchette seldom, if ever, escapes. The remainder of the infant then passes, and with it a gush of blood and the rest of the amnionic fluid. The uterus now contracts firmly on the placenta, and may be felt, as a hard globe, above the symphysis; while the abdominal walls become flaccid, and the mother experiences a feeling of calm and perfect rest, which yield to her, from the comparison, a sensation of delicious repose.

FIG. 97.

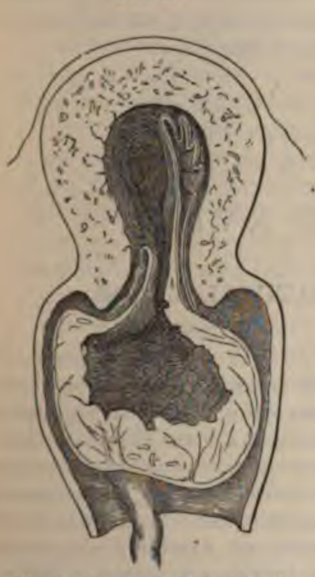


Distension of the perineum. (After Hunter.)

The Third Stage.—The final contractions of the second stage are sometimes so violent as to expel the Placenta along with the child. This, however, is an unusual occurrence, and what generally takes place is as follows: The child, on its birth, remains connected with the placenta by means of the cord, which, for a time, continues to pulsate. The latter being divided, in the manner to be described in the following chapter, the woman remains at perfect rest for an interval of about ten minutes or a quarter of an hour, on the average. The uterus then begins spontaneously to contract upon the placenta, the expulsion of which organ constitutes the Third Stage of labor. The pains of this stage, although of the same expulsive nature as those which preceded it, are comparatively trifling, and are accompanied with more or less of the blood which has escaped from the ruptured utero-placental vessels. They have, on this account, been termed by writers *dolores cruenti.* A few of these contractions is generally sufficient to effect the complete separation of the organ, and its propulsion into the vagina, but the feeble contractile power of the latter often renders it necessary to give some assistance in the delivery. The placenta and the adhering membranes being expelled, this final act terminates the labor.

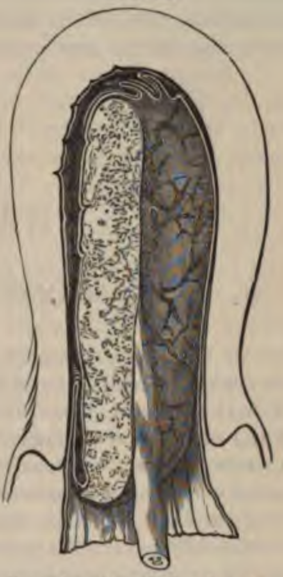
The description originally given by Baudelocque as to the mechanism of the birth of the placenta, has been adopted by almost all modern authors, and the demonstration which has lately been given of it by Schultze, in his admirable Wandtafeln (see Fig. 98), is in every respect confirmatory of the views of the great French obstetrician. The description given by them of the process is, that the placenta passes through the vagina inverted, with its fœtal or amnionic surface turned outwards, an assertion which, in so far as the *natural* process is concerned, is quite incorrect. That the placenta passes, in a large number of cases, in the manner shown in the accompanying figure, is probably true enough, but the reason is, that the practice of pulling on the cord is resorted to with too great frequency in general practice. For if we believe that the normal process is thus represented, it will seem rational enough when delay occurs to pull gently towards the ostium vaginæ that portion which nature intends should first be born. In cases, however, which are left entirely to nature, it will almost invariably be found that it is not the fœtal surface but the edge of the placenta which presents; and it is this part, overlapped it may be by the membranes, which will be found to pass first both into the vagina and through the vulva. This is the description which has been given by Lemser, Cazeaux, and some others; and, more recently, Dr. Matthews Duncan has, in a paper distinguished by his usual ability, put the matter in a perfectly clear light. In his drawing, which we here reproduce slightly modified, the placenta is shown folded upon itself, with the detached uterine surface turned towards the observer; "but the folds are," as he

FIG. 98.



Alleged inversion of placenta in the third stage.

FIG. 99.



Normal position of the placenta in the third stage.

observes, "according to the length of the passage, not transverse to it, as inversion or presentation of the fœtal surface imply." We are fully persuaded that the observation of half a dozen cases, in which no interference with the cord is permitted, will convince any one of the truth of these assertions. It will be shown presently that they involve some points of practical importance.

The uterus may now be felt behind the pubis firmly contracted, and on the maintenance of this tonic contraction depends mainly the safety of the woman from the dangers of post-partum hemorrhage. It very frequently occurs, however, that the rhythmical efforts persist, when the womb may be felt in alternate stages of relaxation and contraction, without necessarily any particular loss of blood.

CHAPTER XVI.

MANAGEMENT OF NATURAL LABOR.

DUTIES OF THE ACCOUCHEUR—PRELIMINARY ARRANGEMENTS—FALSE PAINS AND THEIR TREATMENT—ARMAMENTARIUM OF THE ACCOUCHEUR—POSITION OF THE WOMAN DURING LABOR—DIGITAL EXAMINATION: POINTS TO BE EXAMINED—THE PATIENT NOT TO TAKE TO BED DURING THE FIRST STAGE—PREPARATION OF THE BED, ETC.—ABDOMINAL MUSCLES TO BE CALLED INTO PLAY DURING THE SECOND STAGE. MANAGEMENT OF THE ANTERIOR LIP OF THE OS—OBSTACLES ARISING FROM RIGID OS, AND FROM NON-RUPTURE OF MEMBRANES—USE OF STETHOSCOPE—VIEWS REGARDING SUPPORT OF PERINEUM—TREATMENT IF LACERATION IS THREATENED—CAUSES OF LACERATION—BIRTH OF THE HEAD—PASSAGE OF THE TRUNK—TREATMENT OF SUSPENDED ANIMATION IN THE CHILD—LIGATURE OF THE CORD—MANAGEMENT OF THE PLACENTA—APPLICATION OF ABDOMINAL BANDAGE—TREATMENT OF THE WOMAN AFTER DELIVERY.

HAVING in the last chapter fully considered the various phenomena attendant upon natural labor, the subject of the duties of the accoucheur remains for our consideration. It is fortunate that, in a very large proportion of all cases, the various stages of labor are effected by the unaided efforts of nature in a manner which renders any "assistance" on the part of the accoucheur, in the ordinary acceptation of the term, quite unnecessary. Indeed, the duties which he has to discharge might, in nineteen cases out of twenty, be performed as efficiently and perhaps more agreeably to the feelings of the patient by a thoroughly trained and intelligent nurse. But in the twentieth case something may occur—and, it may be, quite unexpectedly—which suddenly demands special experience, operative skill, and a thorough practical knowledge of the healing art. It is only, however, as has already been observed in the introductory chapter, by a careful study of the normal process, that it is possible for us to recognize speedily, and with unerring precision deviations from the physiological standard; and this reason alone would suffice as an apology for a branch of practice which some look upon with disdain. But a more important reason still is to be found in the fact that many of the dangers and complications of labor arise so suddenly that, unless aid is at hand, the life of mother or child, or of both, may be sacrificed; for, as at present trained, it is rare to find a nurse who has the skill requisite for the management even of the more remediable complications of midwifery.

There are numerous points of detail which contribute greatly to the comfort of the patient, in regard to which an intelligent nurse is perfectly well informed, and the management of which may be left in her hands, if we have confidence in her ability. This, however, manifestly applies only to the wealthier classes, who alone can command the services of such skilled attendants; but, as the practice of the great majority of professional men extends, more or less, in directions where he has himself to discharge many of the duties which are more properly those of the nurse, it is necessary that every young practitioner should thoroughly understand what these are. And, in any case, the failure of the nurse may devolve these duties upon him, so that it is of further importance that he should be familiar with them, in order that he may be able at once to detect incompetency, and to remedy its defects.

The judicious management of a case of labor may be held to include certain preliminaries in regard to which women, and more especially primiparæ, often require some advice. The systematic neglect of the bowels which women so often practice, is likely, if persisted in, to be a cause of much discomfort; and she should therefore be enjoined on no account, as the period of labor approaches, to neglect this function. In most cases, it is proper, by a laxative given at the outset of labor, or by the administration of an enema, to make sure that the lower bowel is empty; for, if this be neglected, the labor will be much more disagreeable to the accoucheur, and may also be unduly protracted. If her health be tolerable, she must not be encouraged to consider herself an invalid, but should be recommended to take such moderate exercise as may seem appropriate, while the tone and general vigor of the system is to be maintained by a sufficient diet, which may be generous, but not stimulating. During the last weeks of pregnancy, the descent of the womb often renders a woman more capable of moving about, from which "it would almost seem," as Rigby says, "that nature intended she should use exercise at this period, and thus prepare her by increased health and strength, for a process which requires so much suffering and exertion."

The perverted and irregular contractions, to which we have already alluded under the name of "false pains," may cause the summoning of the accoucheur long before his services as such are required. Those pains will often, upon strict investigation, be found to depend upon derangement of the bowels, or upon reflex irritation starting from some other source; and, in this as in many other cases, the success of the treatment will depend upon the intelligent appreciation of the cause. The uterus may be the seat, as every one knows, of congestion, as well as of neuralgic or rheumatic affections, the latter being of much less frequent occurrence than was at one time supposed; and each of these conditions may involve special or peculiar treatment. But, in most cases, the treatment will consist in rectifying the state of the bowels, and, thereafter, in allaying uterine irritation by the administration of an opiate, which will generally at once arrest the spasms, and will also procure refreshing sleep for the patient, of which she may for some time have been bereft. Should any reliable evidence of congestion exist, it may be advisable, when the period of natural labor is close at hand, to reduce this by external fomentations, and by tartar emetic combined with small doses of opium. For, in some such cases, it will be found that an unusual rigidity or dryness of the parts exists, which, if unaltered, will almost certainly act as an impediment to labor. By mistaking false for real pains, we may, in our ignorance, allow the woman to go on suffering that which we generally have it in our power to alleviate.

The practitioner will often, to his great annoyance, be called to the bedside of his patient, when, although labor may have commenced, the period is yet distant at which his services will be required. Such a summons should, however, be promptly obeyed. For, although in most cases it will be time lost, it is of the greatest possible importance that anything abnormal should be detected as early as possible in the course of labor. We are then in a position leisurely to determine our plan of procedure; and, should any operative assistance be required, to select that period for it which is most favorable in the interests of mother and child. We are able, moreover, when we have an early opportunity of examining the case, to form an opinion, to which experience will lend confidence, as to the probable duration of the case, and this enables us to leave the patient for a time, and to attend to such other of our professional duties as may be most urgent. If the symptoms are such as to convince us that the woman is really in labor, we should always make an examination before leaving. In proposing this, especially in women who are in labor for the first time, we should never forget the consideration which is due to the feelings of the patient, whatever be her rank in life. For it cannot be otherwise, than that a woman must look upon such an examination as is necessary, by a person of the other sex, with apprehension, if not with abhorrence; but, if the necessity be first explained to her in a few kindly words, she will rarely fail to appreciate the good feeling which prompts them, and will submit without a murmur to whatever may be deemed essential to her safety or comfort. A similar feeling must guide us in everything we do in the practice of midwifery, and if so, we shall seldom fail to win the confidence of our for the guidance of the young practitioner in this respect, is simply patient. To lay down, however, as some have attempted to do, rules absurd; for, to tell a man of grave demeanor to look cheerful, and a man of lively and jocund spirit to look grave, is to make both artificial, and more like fools than rational beings,—a state of matters little likely to establish confidence or to engender esteem.

There are certain articles of his armamentarium which the accoucheur should look upon as indispensable, and should therefore carry with him as a matter of course: these are an elastic catheter, a small vial of some approved preparation of opium, and a similar quantity of the liquid extract of ergot. To these may be added chloroform and sal-volatile; and, if we are going to any distance, we should certainly take the forceps, which does not occupy much room in the gig or saddle-bag, whereas its absence may possibly cause many hours of delay, and increase danger. It is the duty of the nurse to provide narrow tape or strong thread for tying the cord, and to have in readiness the abdominal bandage, scissors, hot and cold water, and a supply of napkins; but, as it will often fall to the lot of the medical attendant to see to these preparations himself, he should, at least, be provided with such material as may be depended upon for ligaturing the cord; and we take it for granted that he habitually carries with him scissors and a stethoscope. For obstetric use, a stethoscope with an elastic stem is to be preferred. He should also give a general glance around, and see that everything is ready which may be necessary for the comfort or safety of the patient.

In making an examination, the most convenient position for the accoucheur, as well as the patient, is that which is invariably adopted in this country. The woman lies on her left side, with her back to the examiner, and near the edge of the bed, which must, if necessary, be previously so arranged as to admit of this.[1] The index and middle finger of either hand,—the right being usually preferred, although the left has certain advantages,—being then smeared with lard or oil, are passed over the perineum, and gently into the vagina up to the os uteri. It is usual to select the period of a pain for the examination; but if so, the finger must not be withdrawn until we have examined the parts in the state of repose also, for the protrusion of the bag of waters during a pain makes it difficult to ascertain the presentation, without risking premature rupture of the membranes by undue violence. The points which one ascertains in the course of the examination are, in the first place, the state of the vagina, whether it is soft, relaxed, and well lubricated with mucus. In regard to the os uteri, we observe whether it is soft and dilatable, or rigid and unyielding, and, to what extent it has become dilated, if at all. Information is, further, obtained, as to whether the membranes are ruptured; whether we have to deal with a natural presentation; and whether there is any pelvic deformity or morbid growth which might impede the progress of labor. And, finally, we may thus recognize at an early stage prolapse of the cord,—a condition which will call for constant care and anxiety, so long as the labor may last. With this view, also, it is usual to make an examination at the time of the rupture of the membranes, as it is at this moment that the loop of the cord frequently descends; and, besides, an examination now enables us, more surely than before, to determine the position of the presenting part. The mode of examination above described is represented in the accompanying figure, in which the examination is being conducted with the right hand. In most cases one finger, as here shown, will suffice, and this should always be attempted when the examination seems to cause unusual pain. The student and young practitioner should avoid making too frequent examinations, for, not only does this irritate the parts, but it tends to remove, at each successive examination, a portion of the lubricating medium, upon the quantity of which depends, in some measure, the satisfactory issue of the

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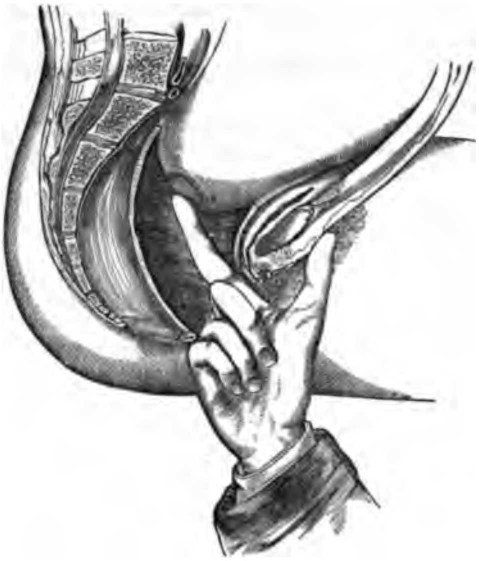
[1] "In the earliest periods of history, women appear to have been delivered in a sitting posture, as is described in the first chapter of *Exodus*. This mode was revived in comparatively modern times; thus Ambrose Paré, in 1573, speaks of a labor-chair, with an inclined back, which he preferred to a common bed. Labor-chairs were brought into very general use upon the Continent in the beginning of the last century by Hendrick van Deventer of Dort in Holland, and, although they have been in a great measure discontinued in modern times, there are still some districts of Germany where they continue to be used. It is a species of *chaise percée*, furnished with straps, cushions, &c., by which the patient can fix her extremities, and thus enable the abdominal muscles to act with the greatest power. In some remote parts of Ireland and also of Germany, the patient sits upon the knees of another person, and this office of substitute for a labor-chair is usually performed by her husband. Labor-chairs, as far as we are acquainted with their history, were never used in this country, nor have they been used for the last century in France, where the patients are usually delivered in the supine posture, on a small bed upon the floor, which has not inaptly been termed *lit de misêre*. A modification of the labor-chair is the labor-cushion, first used by Unger, and afterwards by the late Professor Von Siebold of Berlin, and Professor Carus of Dresden: it is a species of mattress, with a hollow beneath the nates of the patient for receiving the discharges which take place during the labor. The patient is compelled to lie upon her back during the greater part of labor, and thus maintain the same position for some time, which must necessarily become irksome and even painful to her. In this country and in Germany the patient is delivered upon a common bed, prepared for the purpose as above mentioned; in England she is placed upon her left side, the nates projecting to the edge of the bed, for the greater convenience of the accoucheur; in Germany—except in Vienna and Heidelberg, where the English midwifery has in a great measure been introduced by Boer and Naegele—the patient is delivered upon her back. In former times, the supine posture was also used in this country, but for about a century the position on the left side has been preferred."—*A System of Midwifery by Edward Rigby, M.D.*

FIG. 100.



Mode of digital examination.

case. The practice of previously smearing the finger with some bland lubricant is resorted to on every occasion in which an examination is found to be necessary, not so much to facilitate introduction,—which the abundance of mucus generally renders easy enough,—as to supply the place of any mucus which may be removed, and in a certain class of cases to protect the finger. The operator should never omit, after an examination, to address a word or two to the patient in a cheerful tone; and, if the presentation be natural, and you are then able to say so, she will always be gratified by hearing that "all is as it should be."

So long as the os uteri is not fully dilated, or, in other words, so long as the first stage continues, the patient should be encouraged to believe that this is a stage which is merely preliminary to the act of parturition; and that, therefore, she should not lie in bed, but rather walk about in the intervals between the pains, and take such light food as she would under ordinary circumstances. If she can be induced to occupy her attention, as far as possible, by any familiar occupation, however trivial, it will be to her advantage, by relieving the tedium of her suffering. If this cannot be done, her attendants should try, by cheerful conversation, to beguile the time, and to divert her mind from the gloomy apprehensions which are of frequent occurrence at this period. The accoucheur should not remain in the room at this time unless there be any special necessity for it, although he may visit it occasionally. To do otherwise would encourage her to expect assistance at his hands, which it is not in his power to afford; and, moreover, his presence would to her seem to imply that he expected a speedy termination of her sufferings. During this stage the woman is frequently advised by ignorant attendants to press down, and with this view footstools are placed at the foot of the bed, and towels are tied to the bedpost, by means of which she may fix the trunk, and bring the whole force of the expiratory muscles to bear. This acts most injuriously on the progress of the labor, for the stage is one of dilatation, and not of propulsion; and if the muscles referred to are thus brought prematurely into play, the voluntary expulsive force is fruitlessly expended before the stage arrives at which it may properly be employed. Nothing, in fact, is more certain than that any attempt, either on the part of the woman, or, on the part of the practitioner, by forcible dilatation of the os, the administration of ergot, or the exhibition of stimulants, to hurry delivery, must be strictly avoided in the course of the first stage of a natural labor. And, even in cases where its duration is prolonged far beyond the average, this of itself is no excuse for interference, unless the general symptoms indicate that it is our duty to accelerate the labor by such means as are within our reach—a state of matters which is of rare occurrence. When the pains flag, it has often been found that the administration of an enema for the purpose of emptying the lower bowel, acts further as an efficient stimulant to uterine contraction.

The pains usually become more severe as the termination of the first stage approaches, and at this period it is advisable that the woman should go to bed, as there is a risk of the sudden propulsion of the child immediately upon the rupture of the membranes. Previous to this, the nurse prepares the bed—which should not be too soft—by placing over it a piece of india-rubber sheeting to protect it from the discharges. Upon this a folded sheet, about two and a half to three feet in width, is placed across that part of the bed upon which the pelvis of the woman lies. By this simple arrangement the sheet may be gradually pulled through as it becomes soiled with successive discharges of liquor amnii, or of blood, and at the end of the labor it is completely removed along with the final discharges which accompany the birth of the placenta. The ordinary night-dress which the patient wears, or rather that part of it which is beneath her as she lies, should be rolled up above the waist, and the lower part of the body covered with a petticoat which opens all the way down, and she should then be covered with such bedclothes as the season of the year and her own feelings may render necessary. She lies on her left side, as has already been stated, with her back to the practitioner, and her head consequently to his left hand; and one of the advantages of such a position is that she is not disturbed by seeing such preparations as may be necessary for her assistance or relief. It is by no means essential that she should occupy this position continuously till the termination of labor. To do so would be irksome in the extreme; so that she may be permitted to lie at will on either side, or on the back, reverting necessarily to the left side only when any occasion may arise for renewed examination.

For reasons above stated, frequent examinations are always to be avoided. From time to time, however, examinations may be instituted with the view of ascertaining the rate of progress which is being made. This has the further advantage of allowing the busy practitioner to absent himself from time to time, for such a period as he judges to be quite safe; but, in this respect, he must always be cautious, as he will be blamed if absent at the critical moment. In some cases, even in primiparæ, a sudden and violent increase in the expulsive force unexpectedly occurs, when, if the parts be soft and dilatable, the birth may take place with extraordinary rapidity. All calculations as to the probable period of delivery must be very uncertain, and although experience gives a certain confidence to the opinion which may be formed, we cannot be too cautious in expressing it; for, not only may it end abruptly as we have seen, but, in other cases, labors, which up to a certain point have advanced in a manner which seemed to render speedy delivery almost a certainty, are suddenly suspended by failure of uterine action, or by some other cause. The child may, under such circumstances, actually be arrested on the very threshold of its entrance into the world.

So soon as rupture of the membranes has taken place, the sheet beneath the patient should be pulled by the nurse towards the edge of the bed, so that she may rest on a dry portion, and avoid the discomfort of lying on a wet bed. The stage of propulsion now usually commences, and it is quite proper, in many cases, to encourage the woman to avail herself of the aid of the abdominal muscles. In most cases, she will do this instinctively, and requires no instruction whatever; but, in others, there is a disposition to waste the force of the expiratory muscles in cries which are worse than useless, and it is in these cases that encouragement should be given. In regard to the means already referred to for fixing the trunk, the accoucheur will use his own discretion as to how far they are to be permitted; for, if the pains are of more than usual violence, we must rather restrain than encourage her efforts, while if, on the contrary, they are slow and inefficient, we may, with perfect propriety, allow of any means which may act by increasing the deficient propulsive force. At any time in the course of the labor, but more especially, perhaps, about the commencement of the propulsive stage, difficulty may arise from retention of urine, in consequence of mechanical closure of the urethra. This requires the use of the catheter, which is to be employed with caution and with due reference, as has already been mentioned, to the anatomical modifications which attend pregnancy. The pressure consequent upon the descent of the head often gives rise to cramps in the thighs, a symptom which sometimes aggravates very greatly the suffering of the patient. We shall not stop here to consider whether this is due to direct pressure upon the large nervous trunks, or to a reflex action; but, in regard to the treatment of what is a troublesome complication, although not a dangerous one, it can only be said that if emptying the bowels by an enema, and warm friction of the thighs should fail to remove the spasm, we can but try such other means of palliation as may occur to us, for in all probability the patient will not enjoy complete relief, until the termination of the labor has removed the cause which is responsible for the symptom in question.

As the head descends in the pelvis, after the termination of the first stage, it not unfrequently happens that the anterior lip of the os remains in an œdematous condition, indicative of pressure of the anterior uterine wall between the presenting part and the symphysis pubis. This constitutes a very manifest impediment to the progress of the labor. It has been said by some of the best authorities that under such circumstances we should never interfere. "All attempts," says Rigby, "to push it up above the head are objectionable, because, in the first place, the finger cannot reach sufficiently high to effect the object, and, therefore, the swelling descends again to its former situation; and, secondly, the efforts to push it up only tend to inflame it, and increase the swelling." To this we must demur. Any attempt, rudely or forcibly, to push up the anterior lip, even when it exists as a manifest impediment, should certainly be avoided; but we are bound to add that, in many cases, it may be pushed beyond the head with perfect safety, and in this way the impediment to delivery may be at once obviated. The swollen part should, during the interval between two pains, be gradually and cautiously pressed up as far as possible beyond the head. If the finger be removed, the tumor descends at once, as Rigby says, but if it be kept in position until the next pain comes on, the head will often pass down, and the cervix be retracted upon it, precisely as occurs at the moment of the passage of the head through the ostium vaginæ, by the action of the levatores ani muscles. This cannot be effected in every instance, but the attempt, if cautiously performed, is free from risk, and in a very considerable proportion of cases, is attended with complete success.

The further progress of the labor brings the head, or other presenting part of the child, downwards, towards the floor of the pelvic cavity. In a certain number of cases, it is, however, impeded in its progress by mechanical hindrances, which it is in our power to remove. The membranes, for example, may be so tough as to have resisted an ordinary amount of force at the period at which they are usually ruptured; or they may be distended by a very unusual quantity of liquor amnii; in either of which cases the bag of waters may constitute an impediment to delivery, which can only be removed by artificial rupture, so as to permit the descent of the head. In other instances, the os uteri presents a condition of abnormal rigidity, its margin being, at the acme of a pain, hard, rigid, and tender. In former times, the practice universally adopted in such a case was bloodletting, and we do not for a moment doubt that the effect of the operation was to relax the rigidity, and permit the descent of the head; but the cases in which we would be justified in bleeding during labor are very limited. It is certainly safer to give tartar emetic in nauseating doses, which will be found to have an equally beneficial effect, and one, at the same time, from which the system can be more easily released than when, by misadventure, too much blood has been abstracted. We have in chloroform another agent which, in such cases, exercises a most powerful influence upon the rigidity of the os, and this we never fail to avail ourselves of in cases requiring operative interference. Chloroform, indeed, in such instances, fulfils a threefold indication, by subduing the rigidity we are speaking of, arresting voluntary movements, and allaying reflex susceptibility. In France, belladonna is used for the same purpose, but what experience of its use we have had, leads us to place little faith in its efficacy.

The stethoscope should be employed from time to time during the course of a tedious labor, to ascertain the vitality and vigor of the fœtus, for there are cases in which the life of the fœtus may be compromised, while that of the mother undergoes no risk whatever. Some, indeed, recommend that, in labor apparently the most uncomplicated, the stethoscope should be frequently used, so that risk to the life of the fœtus may thus be reduced within the narrowest possible limits.

When the further progress of the case has brought the head to press against the perineum, as is shown in Fig. 97, it distends or bulges that structure outwards, or rather downwards, more and more during every succeeding pain; and the position of the patient on the left side enables us often to watch the process without her being aware of any exposure. The axis of motion is now no longer downwards, but forwards in the direction of the subpubic angle, as will be fully described in a subsequent chapter. A very usual practice at this stage, is to separate the knees by means of a pillow or otherwise, so as to encourage, as far as possible, the movement in this direction. This has, however, been condemned by some of the best authorities, on the ground that labor should be habitually retarded at this stage, an argument, the force of which, we confess, we can scarcely admit. And this for two reasons: first, because the position on the side, which involves apposition of the knees, is singularly unfavorable to movement of the head in the direction which we have indicated as normal; and, second, because, in a large majority of cases, the separation gives the woman great relief, a fact which is familiar to every experienced nurse.

The most important point, however, connected with this stage of the process is, undoubtedly, the Support of the Perineum—a mode of procedure which is recommended in some form or other by most writers on obstetrics. Many years ago, our attention was, by an accidental circumstance, very particularly directed to this matter, and we published some time afterwards a paper on this subject,[1] which was founded not only on a careful clinical study of the phenomena of this stage of labor when unaided, but also on a critical examination of the views entertained by those who practice support of the perineum, and of the reasons which swayed them. The points brought out were mainly these:

The earlier writers recommended only, in reference to this stage, the free use of lubricants and emollients. About the middle of the last century, Smellie advocated artificial dilatation of the external orifice of the vagina; Puzos, stretching of the parts along with lubrication; and Roederer, pressing of the perineum towards the sacrum; all these modes of treatment differing greatly from the modern procedure. To whom the practice of perineal support is originally due is a matter of doubt, but, in the treatise published by Professor Hamilton of Edinburgh, in 1781, we find it mentioned as a distinct system, applicable alike to natural labor and to that which is in any way abnormal. This author, like Puzos, advocates the use of lubricants, and recommends us to release the perineum when the head is being born, "by cautiously sliding it back over the face and chin of the child." From this time writers have, in the main, agreed that, by a support of the perineum, lacerations are to be prevented; but they have not agreed as to what "support" is, or to what extent it is to be practiced. It would carry us far beyond the limits within which the subject must here be confined to examine critically the views which are, or have been, entertained by the most approved authorities on this point. We shall, on this account, refer only, and that very briefly, to the opinions which are promulgated by some of the authorities referred to.

Dr. Ramsbotham says: "As soon as the head has come to press on the external parts, it becomes our duty to take our seat by the bedside, and never to move from our position till the child has passed. This we do to protect the perineum and to prevent laceration." . . . "Place your elbow," he continues, "against the bedstead, regarding it as a fixed point, and allow the perineum to be forced against your hand." Fortunately there are few, if any, teachers of midwifery who go to such an extreme in the recommendation which they give to their students; for we believe that support of this kind can scarcely fail to bring about the very accident which we are striving to avert. Dr. Tyler Smith pointed out many years ago, that pressure upon the perineum is apt to excite the uterus to increased contraction by a reflex action starting from the nerves which are distributed through the former structure, and, on this very good and sufficient ground, he dissuades us from practicing systematic support. Churchill recommends very gentle and careful support, and in concluding his observations on this point, informs us that it has been his lot to witness "more than one case where rupture was owing to excessive and injudicious support." Denman only sanctions support in first cases, while Naegele plainly says, "under ordinary circumstances, any support of the perineum is unnecessary."

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[1] Glasgow Medical Journal. January, 1860.

It was a careful study of these opinions among others, along with the careful observation of the process in nature, which led us long ago to condemn support of the perineum as irrational and useless in all cases, and undoubtedly hurtful in some. It must be admitted, however, that the method usually adopted, which consists in very gentle support, with the view, mainly, of directing the head forwards, probably does no harm; the palm of the left hand, protected by a napkin, being laid along the perineum, and pressed against it during a pain. Two points must here, however, be borne in mind; that the perineum must sooner or later yield, and that support necessarily implies opposition to the progress of the head. If, therefore, we admit support as a rule of practice, we shall find ourselves opposing a natural process, and presuming to teach Nature a lesson. If any one will but take the trouble in a single case to watch the admirable manner in which nature effects her purpose in dilating the perineum, each pain increasing the dilatation by a carefully graduated force, until at last the orifice permits the passage of the head, the observation will go further to convince the most earnest advocate of the doctrine of support than any mere argument can do. And be it remembered always, that, do what we may, rupture of the perineum will, in a certain proportion of cases, as is admitted by every one, occur.

The practice of perineal support, then, is, if very gentle, harmless. Indeed, we are inclined to admit that, in some cases of deficient contractile power, it may be beneficial, but in a way very different from what the operator counts upon—by exciting more energetic propulsive action. The practitioner, however, who never puts his hand to the perineum, will, we firmly believe, have fewer cases of ruptured perineum in his practice than he who admits support in any form as applicable to every case of labor; while, if he adopts the advice of Ramsbotham, as above quoted, he will, beyond all reasonable doubt, sometimes cause the very accident which he is attempting to prevent. We do not think, in reference to this subject, that we take an exaggerated view of the case in looking upon it as a relic of "meddlesome midwifery," in which we presume by irrational and bungling interference to dictate to nature.

The proper management of this stage—which will be found to be attended with results of the most satisfactory kind—consists in watching the amount of pressure to which the perineum is being subjected. This may be done effectively and easily by keeping a finger on the anterior margin of the perineum, which enables us, with a little practice, to gauge with tolerable accuracy the degree of propulsive force which is being exercised. Should this exceed the normal standard, so as to imperil the integrity of the tissues, we must then order all aids to expulsive effort to be removed from the reach of the patient, and at the same time encourage her to cry out lustily during the height of a pain, or, in other words, to make free use of the safety-valve of the glottis. Should circumstances render it expedient to oppose the advance of the head with the view of rendering the process of dilatation more gradual, this should be done, not by pressure on the perineum, but by pressure exercised directly upon the head of the child, which is to be pressed towards the hollow of the sacrum. But the effect even of such pressure is in most cases doubtful, and the greatest possible care must be exercised lest we divert the force which should be expended in the direction of the pubic arch, and, by bringing it to bear directly upon the perineum, thus enhance its risk of rupture.

In all first cases, the fourchette is slightly lacerated, but the rupture seldom extends further. In cases in which there exists morbid rigidity, cicatrices, or a diseased state of the parts, the rent may extend deeply into the perineum, and even in extreme cases through the sphincter into the anus. We must guard, however, against taking too serious a view of such a laceration; for what may seem at the moment of delivery to be a serious surgical lesion, turns out in the course of forty-eight hours, and in consequence of the retraction of the parts, to be but a trifling fissure. It is not, as a rule, by the passage of the head that the most serious lacerations are effected; they are often commenced by this, but it is the passage of the shoulders which extends the rupture. Sometimes, the pernieum gives way under an amount of pressure which is comparatively trifling, suddenly yielding in its whole extent like a piece of wet parchment; and it is in regard to these cases that a suspicion has arisen as to the possibility of disease in the structure of the parts. There is also an increased risk of perineal rupture in certain forms of pelvic deformity—such as diminution in the transverse diameter of the outlet. This involves an approximation of the tuberosities of the ischia, and an abnormal acuteness of the subpubic angle—conditions which obviously must make the head pass further *downwards* in the direction of the perineum, before it is possible for it to move *forwards* under the arch. The unskilful use of instruments is also a fertile cause of perineal rupture, and the same may be said of carelessness in operative manipulation. Certain rare cases are recorded in which the child has actually passed *through* the perineum, by forcing a passage through this structure and the anterior wall of the rectum, while the posterior commissure of the vagina remained unruptured.

Rigidity of the perineum is an affection which sometimes causes a very serious impediment to the completion of labor. If it be simple rigidity, unconnected with any lesion, and accompanied with dryness of the parts, the treatment applicable in the case of rigid os may be tried here also, for there is no doubt that in such a case, bloodletting, warm baths, and tartar emetic would have a beneficial action; and there is no reason that we can see why, in such cases, the old-fashioned treatment by lubricants may not be useful. But there are cases in which rigidity is the cause of rupture; and, when the latter is impending, we may occasionally be justified in making a slight incision with a lancet, or tear with the finger-nail if possible, on each side, as has been practiced by some of the most distinguished accoucheurs. In this case, the laceration which attends the passage of the child is, both in direction and in extent, a matter of very little importance. This is an advice, however, that one is almost afraid to give to the inexperienced, as there is much risk of its being improperly and unnecessarily resorted to. The treatment of perineal laceration will be referred to in another place.

When the passage of the head is completed, we should ascertain if the cord is around the neck, and if so, it must be slipped over the shoulders, or pulled down so as to protect the neck from injurious pressure. One hand is to be placed over the fundus uteri, which is to be gently pressed, and followed in its descent by the hand,—a practice which tends to promote the speedy separation of the placenta. Unless there are symptoms of threatened asphyxia in the child, or circumstances which demand immediate delivery, we should not in any way interfere in the birth of the trunk, which will be naturally effected after a short pause, generally counted by seconds. We must now place the child in such a position as will enable it to breathe freely, and should efficient respiration not immediately ensue,—the best evidence of which is a loud cry,—it will be our duty at once to adopt such means as are best suited to excite respiratory action. The stimulus afforded by exposure to the external air, along with certain centric causes arising from deficient aeration of the blood, are generally sufficient to excite the muscles which contribute to the act; but, should these fail, it will be proper, by blowing on the face, a smart pat on the nates, or sprinkling with cold water, to set the function going without delay. Failing this, the infant should be plunged in a basin of warm water, and cold water plentifully dashed upon it as it is removed from the bath. The tongue should be drawn forward, the mucus rapidly removed from the fauces as far as possible, and regular attempts at artificial respiration persevered in so long as the slightest action of the heart continues. In cases of suspended animation, the cord should not be tied until it has ceased to pulsate, as there is a possibility, in such circumstances, of a certain amount of placental respiration. The child is also threatened with asphyxia in cases where it is born along with the unruptured membranes, and thus remains, after its separation, enveloped in its intra-uterine coverings and bathed in the liquor amnii. In this case the membranes must be instantly ruptured, and the possibility of aerial respiration thus established.[1]

The infant being born, and having given proof of its independent existence, our next duty is to ligature and cut the cord. The material to be used as a ligature is a matter of no very great moment, provided it be of sufficient strength,—some preferring strong thread, and others a material which, while it compresses efficiently, is not so incisive as the ordinary surgical ligature, by which the gelatin of Wharton is actually cut. The material preferred by the latter is strong narrow tape, of which the narrow red tape of national tradition affords a good example. The ligature should be placed about two or three inches from the umbilicus, and should be drawn with sufficient tightness to prevent the possibility of oozing. The knuckles should be brought together, while the knot is being drawn, to steady the hands; for, were the ligature to snap, in the absence of this precaution, the funis might be torn from the umbilicus or its placental attachment, and thus give rise to much trouble and some risk. The reason of applying the ligature at such a distance from the umbilicus, is to leave room for another should the first fail. It is usual to apply a second ligature on the placental side of the first, and to cut the cord between the two; but the advantage of the additional one consists entirely in preventing the fluid contents of the umbilical vessels from further soiling the bed linen. In reference to this, Dr. Dewees, who disapproves of the application of a second ligature, observes that "the evacuation from the open extremity of the cord will yield two or three ounces of blood, which favors the contraction of the uterus and expulsion of the placenta." In the case of twin pregnancy, a second ligature should always be applied, as the cords occasionally communicate. The cord may be divided by a pair of blunt scissors, for the more the walls of the vessels are lacerated, the less likely is subsequent hemorrhage to occur.

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[1] In this case the child is said to be born with a "Caul." It is supposed to be indicative of good luck and prosperity, and in seaport towns the caul is carefully preserved, and is believed by the credulous to be a talisman which protects the wearer from death by drowning.

The child being separated and handed to the nurse, there only now remains, to complete delivery, the Third Stage, or expulsion of the placenta. If we do not feel that the uterus is firmly contracted behind the symphysis, we should now attempt by friction over the fundus to excite it to contraction; if, on the contrary, it is quite firm, the case should be left absolutely to nature. If, in the course of fifteen or twenty minutes, no attempt at expulsion shall have occurred, we should pass a finger into the vagina, using the cord as a guide, in order to ascertain whether or not the separation of the placenta is complete. When, with a single finger, we can reach with ease the insertion of the cord, we may infer that the placenta, or at least the greater part of it, is in the vagina, and under such circumstances we may attempt to hook down the edge of it, at the same time drawing gently on the cord. But when we find the cord passing up into the uterus beyond our reach, the edge of the placental mass which presents at the os uteri being alone accessible, we know that the placenta, although probably completely separated, has not as yet been expelled from the uterus, and we wait for a further period of ten or fifteen minutes, attempting the while, by renewed frictions, and so forth, to awaken the dormant uterine energy. It will be necessary, however, in a certain number of instances, to assist nature in the completion of this stage. An intelligent apprehension of the manner in which the placenta is naturally expelled, which is described in the preceding chapter, will prevent us under such circumstances from doing, what is too common in midwifery practice, viz., forcibly pulling on the cord. In a large proportion of cases, the delivery of the placenta will doubtless by this means be effected, it being hauled through like an inverted umbrella, but the amount of hemorrhage, at the time and afterwards, which attends such a mode of procedure, is thus very unnecessarily increased. The proper course is to pull down the presenting portion of the placenta, using only such traction upon the cord as may assist us in effecting this object. Our first efforts of extraction should be made in the axis of the uterus, backwards and downwards, which is to be altered, as soon as the placenta passes into the vagina, to a direction downwards and forwards, corresponding to the axis of that canal. Should we fail in this attempt, or should there be danger of a portion only of the placenta being removed, it will be proper to introduce cautiously the hand into the uterus to such an extent as may be necessary for the complete extraction of the mass; and, if it should then be found, as is sometimes the case, that morbid adhesions exist, these must be broken down in their whole extent, and the hand, if possible, not removed until the entire placenta is brought with it. Irregular contraction of the uterus may also prevent its expulsion, and of this a familiar variety is described as "hour-glass" contraction, the organ being retained in the upper segment by a constriction.

When the placenta is expelled, or has been extracted, it is well to look at its uterine surface, to see that no portion of it has been left behind; and it is also of importance, as it escapes from the external parts, that the adherent membranes should pass along with it, as otherwise a portion of them is torn off and left behind in the uterus. With this object in view, we are advised to twist or rotate the placenta as it is passing the vulva, the membranes being thus twined into a sort of rope, which renders them less likely to tear. The uterus is now to be examined, and we must satisfy ourselves of its existence in the form of a firm tumor behind the pubes about the size of a child's head. The prepared sheet being now pulled from beneath the woman, and with it, as far as possible, the discharges, she may be allowed to lie on the back, with the legs extended and the knees together. In this position, the condition of the uterus may be still more satisfactorily ascertained, and it is a good plan in practice to place the hand of the patient over the uterus, and instruct her to press gently upon it occasionally, which insures the expulsion of any clots which may be retained, and, in the case of pluriparæ, has an excellent effect in moderating after pains. So soon as we are satisfied with the contraction of the uterus, and the woman has been made comfortable by the removal of the petticoat, and rolling down of the night dress which has thus been preserved from the discharges, a dry napkin is placed over the pudendum, and the abdominal bandage applied. The object of this bandage, the propriety of which has been disputed, is to afford the uterus and other organs some support, as a substitute for what they have lost in the sudden relaxation of the abdominal walls. If there is any tendency to hemorrhage, it is usual to fold a towel in the form of a pad, and place it beneath the bandage over the uterus, so as to exercise more direct pressure over that organ. Another and subsequent use of the bandage in the hands of a skilful nurse is the preservation of a woman's figure, a matter to her of no little importance. Bandages are often shaped, in which case they have sometimes a T bandage attached to keep the napkin in contact with the external parts. In ordinary practice, nothing is better than a bolster cover, which when pinned firmly over the abdomen, serves the purpose admirably.

So soon as the bandage has been applied, and the comfort of the mother otherwise attended to, the nurse is at liberty to dress and attend to the child. The patient must be strictly enjoined to maintain the horizontal position, as fatal cases have occurred in women who had imprudently assumed the erect posture shortly after delivery, and had thus established such hemorrhage as immediately proved fatal. A single glass of sherry or claret with water may be allowed; but it is truly astonishing how seldom this is necessary, so admirably is the effort even of weakly women compensated for. It is advisable for the practitioner not to leave the house too hurriedly, until he feels confident that all is well, and, more especially, that there is no tendency to post-partum hemorrhage. An excellent physiological method of averting the latter, is to put the child early to the breast, which seldom fails to excite reflex uterine contraction; and this acts otherwise advantageously, although there is no milk in the breasts, by drawing out the nipples.

CHAPTER XVII.

THE MECHANISM OF LABOR.

IDEAS WHICH LABOR INVOLVES—DIFFICULTY AND IMPORTANCE OF THE SUBJECT—HISTORICAL SKETCH: VIEWS OF SIR FIELDING OULD; OF SMELLIE; OF SAXTORPH; OF SOLAYRÉS DE RENHAC; AND OF NAEGELE—NATURAL AND FAULTY PRESENTATIONS—CRANIAL POSITIONS: OCCIPITO-ANTERIOR AND OCCIPITO-POSTERIOR—FIRST POSITION: PELVIC OBLIQUITY: OCCIPITO-FRONTAL OBLIQUITY, OR FLEXION: THE HEAD "AT THE BRIM:" EXAMINATION OF FONTANELLES AND SUTURES—ROTATION: CAUSES OF—THE "PRESENTATION," OR "PRESENTING" POINT—THE CAPUT SUCCEDANEUM—THE CHIN LEAVES THE CHEST—FURTHER DESCENT AND BIRTH OF THE HEAD—OBLIQUITY AT THE OUTLET—MOULDING—EXTERNAL ROTATION OR RESTITUTION OF THE HEAD—SECOND POSITION: THE CONVERSE OF THE FIRST—RÉSUMÉ OF MECHANISM IN OCCIPITO-ANTERIOR POSITIONS.

THE primary idea of Labor comprises three secondary ideas: a body which is to be propelled, a force by means of which the propulsion is to be effected, and a passage through which it takes place. The mechanism of birth thus includes, in its most comprehensive sense, all mechanical questions which spring from the elaboration of these three ideas. The various points connected with the anatomy of the parts, and arising from a consideration of the various forces which contribute to effect the expulsion of the child, having been already fully discussed in preceding chapters, there remains still for careful study, the relation which the body propelled bears to the canal during the different stages of labor. It is in this higher though more restricted sense that the term Mechanism of Labor is employed, and a study of this subject includes, therefore, a thorough and critical examination of the physical laws according to which the process of parturition is, in the human race, effected.

A knowledge of this section of the subject has been fitly described as the keystone of the art of obstetrics. For, without an intelligent apprehension of the various doctrines involved, the practice of midwifery is reduced to a mere handicraft, in which a certain amount of manual dexterity may be attained, but which, under such circumstances, is utterly unworthy of the dignity of a science. We cannot, therefore, too earnestly, or too emphatically, urge upon the student the necessity of mastering at the outset this important subject, upon which a great part of what is to follow is founded. It is not by any means an easy matter, just at first, clearly to understand the descriptions given in books, or to follow the process as described at the bedside. This demands sustained attention, and a perseverance which is apt to be baffled by the peculiar circumstances under which the investigation is conducted. We may here mention shortly what the chief difficulties are, and how they may in some measure be avoided.

The most effective descriptions, and such as are most useful to the student, are, undoubtedly, those in which unnecessary complication is most scrupulously avoided, and in nothing is simplicity more essential than in the various classifications of labor according to the position of the child within the pelvis. A simple system ought, therefore, in every case to be preferred; in regard to such as are more complicated, it has been well observed that divisions and subdivisions may be multiplied almost at will. The chief difficulty of the beginner arises from the somewhat complex mental process through which alone he can determine the exact position of the child in any given case—a difficulty which the obstetric position in this country somewhat increases. For not only have we to figure to ourselves the child with its axis inverted —standing, so to speak, upon its head, which is towards the os uteri— but we have also to allow for the position of the woman, lying, as she does, horizontally, or with the long axis of her body at right angles to that of the accoucheur. Some of this difficulty is avoided by remembering that in almost all cases the right side of the child corresponds to the right side of the mother; that its back is turned to her anterior or abdominal surface, and that its head is downwards in the direction of the os. These are the first points which it is necessary clearly to understand in regard to the position of the child in natural labor; but, essential as such preliminary knowledge is, it has no direct reference to what is known in modern times as the mechanism of labor.

The facts just stated comprise wellnigh all that was formerly known in reference to the position of the child during labor, and their observation led to very erroneous conclusions as to the manner in which the birth of the child took place. Until 1741, it was, in fact, assumed that there was no special mechanism of labor beyond the mechanism which attends any vital expulsive act, and that the passage of a fæcal mass or a half-organized clot was as little regulated by fixed mechanical laws as was the birth of the child. The universal belief was, that the child lay in the womb with the face directly backwards; and that, in its descent through the pelvis, it never altered this position in its course from the brim to the outlet, "so that," to use the words of one of the writers of that period "it seems, when she lies upon her back, to creep into the world on its hands and feet." As in regard to most great discoveries, so in this instance was the development of more correct views a gradual process, and the result of the investigations of successive observers. It was from first to last a process, in the case at least of those who contributed in any considerable degree to its advance, of close inductive reasoning, according to which, step by step, during a period of about eighty years, the subject gradually emerged from obscurity. Nothing tends so much to impress upon the mind the great facts which have been disclosed in the course of this investigation, as a narrative of the successive steps by which the truth was ultimately attained; and we shall, therefore, here call attention to the more important contributions which have from time to time been made in this direction.

The honor of the first step in the process of demonstration is undoubtedly due to Sir Fielding Ould of Dublin, who published to the world, about the date above mentioned, a statement to the effect "that the breast of the child does certainly lie in the sacrum of the mother, but the face does not; for it always (when naturally presented) is turned either to the one side or the other, so as to have the chin directly on one of the shoulders." The idea here involved is the twisting of the neck, so as to bring the long diameter of the head into the same diameter as that of the shoulders, the greatest diameter both of the head and the trunk being thus arranged so as to avoid the limited antero-posterior measurement of the brim. The step next in succession was achieved by Smellie. This excellent obstetrician, whose work is still deservedly ranked among the classics of English midwifery, confirmed Ould's observation that the long diameter of the head occupied the transverse diameter of the brim, as it found, in that direction, the most ample accommodation. But to this, he adds, as the results of his own observations, that the long diameter of the head *rotates at the outlet into the antero-posterior diameter*, which his measurements, allowing for the recession of the coccyx, clearly indicate as the best. In many respects, the views enunciated in this admirable work come much nearer the truth than some of a later date; and its translation into several Continental languages brought the opinions of the author prominently under the observation of the medical schools of Europe. From that time, indeed, no writer of note in any language has failed to pay his tribute of admiration to the importance of Smellie's works, and the genius of their author.

The work of Smellie found Continental obstetrics in a most unfavorable state as compared with the English school, and provoked much unfavorable criticism. Steadily, however, his ideas gained ground, although considerably disturbed by the excitement of those who joined with Levert in forming what we may term the geometrical school of obstetrics, and who believed with their master "that labor was a purely mechanical operation, and susceptible of geometrical demonstration." The ultimate adoption by the most able Continental obstetricians of the views of Smellie undoubtedly preceded the brilliant results which a few years later were disclosed, and for which we owe them so much. It was admitted, as proved by Smellie, that there is a determinate relation between the pelvis and the child's head during the whole time of labor. But the point now for the first time disclosed, was that the head passes into the pelvic cavity, in a position which corresponds neither to the transverse nor the conjugate diameter, *but is intermediate between the two, or oblique.* The names of Saxtorph of Copenhagen, and Solayrés de Renhac of Montpellier, are specially connected with the discovery and announcement of this fact, which was published almost simultaneously by them about 1771. We believe, however, that the discovery had been made at an early period by Berger, whose pupil Saxtorph had been, not later than 1729. Of this, indeed, there is internal evidence in Saxtorph's works, who, far from claiming originality, says in a note to one of his papers on this subject, "In a similar manner, Berger saw the true position of the head in labor, and imparted it in his lectures." But, however this may be, it is certain that, but for Saxtorph and Solayrés, this great truth would have remained unknown, possibly even to the present day. We have elsewhere[1] stated and fully analyzed the views of these distinguished observers, at a length which is here quite impossible. We may state, however, in general terms, that the discovery with which their names will always be connected, embraces the fact that the long diameter of the head not only occupies in the pelvis an oblique diameter, but that it occupies in the great majority of cases *the right oblique diameter.*[2] Solayrés gives, further, an elaborate account of the mechanism of labor in the different positions of the head, and in this he is followed by his pupil and enthusiastic admirer, the celebrated Baudelocque; the tendency of both writers being to run into too great elaboration in classification and description. Baudelocque seems in some measure to have recognized the rotation which takes place in occipito-posterior positions of the head, the clear demonstration of which is certainly due to Naegele, and the discovery of which is generally attributed to the same writer. Between Baudelocque and Naegele, no name occurs, the mention of which is essential to the elucidation of the subject in question.

In 1818, Professor Naegele, of Heidelberg, published, on this subject, a small pamphlet, of insignificant appearance, which was, nevertheless, destined to exercise a greater influence, in regard to this question, on the professional mind than all the ponderous tomes of the hundred years immediately preceding. "No other work of equally small size," as Dr. Tyler Smith well observes, "ever exerted greater influence upon any branch of medicine than that of Naegele upon midwifery. It may be termed, indeed, the Euclid of Obstetrics; but it will not have executed its mission until every accoucheur, in each individual case coming before him, entirely masters the position of the fœtal head. Nothing less than this should be aimed at by every obstetric practitioner." Without in any way attempting to detract from the merit of Naegele,—a merit which will have its recognition so long as medical science has a name,—we believe that the views promulgated by him have been too implicitly believed in and adopted by the great majority of obstetric writers. The translation of his essay by Rigby, and the enthusiastic defence by the latter of every theory and doctrine which emanated from his master, produced a powerful impression; and, in point of fact, from that time, English writers have, with few exceptions, reproduced, without modification, and as demonstrated facts, the whole of the conclusions of the great German obstetrician. Indeed, it is not too much to say, that the view generally entertained, even by the ablest writers, amounts to this,—that the subject had been so expounded by Naegele that there was nothing further to demonstrate, that every problem and theorem was solved, and that his conclusions were to be accepted as an absolute solution of all the difficulties and the perplexities of the past.

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[1] The Mechanism of Parturition. London, Churchill, 1864.

[2] The student will carefully note the fact that, in this work, the two oblique diameters take their name "right or left" from the sacro-iliac synchondrosis from which they spring. This has already been stated in an early chapter, but is here repeated, as unfortunately, by some writers, the nomenclature of these diameters is reversed.

Some have ventured, however, both in this country and abroad, to demur to this, and to assert that the matter is not yet set at rest, and that the *ipse dixit*, even of Naegele, is not to be admitted as infallible. And, indeed, if we reflect as to what was the state of the subject when he wrote, while acknowledging that there is that in his discoveries which merits all the fame which attaches to his memory, we can scarcely conceive it possible that one mind could so grasp all the details as to make chaos order, and leave no point unassailable, and no question unsolved. In forming his conclusions, no one could be more earnest and faithful in his observations of nature than Naegele; but, in some respects at least, he was mistaken, and from some of his facts he drew erroneous inferences. To him is due the whole credit of showing,—although he exaggerates it,—that the head lies in the right oblique diameter in a preponderance of cases such as had never been dreamed of. He demonstrated also, what every intelligent accoucheur has corroborated many times in his own practice, the rotation which naturally occurs in occipito-posterior positions of the head. And he showed that, in ordinary labor, the forehead does not rotate completely into the hollow of the sacrum, but still retains, in a certain degree, its oblique position. Finally, he asserted, and is admitted by most systematic writers to have proved, that there exists, on the part of the head in its descent through the pelvis, a *biparietal* obliquity, according to which one ear is approximated to the corresponding shoulder. We accept, in general terms, all his conclusions, with the exception of the last, to the investigation of which we have devoted much time and patience, and conclude, unhesitatingly, with Velpeau, Cazeaux, Matthews Duncan, and many others (the number of whom is constantly increasing), that no such biparietal obliquity as Naegele described exists as a normal phenomenon of natural labor.[1]

Presentations.—The term "presentation" is generally held to imply the part which presents, and has no reference to "position," which is used in another and more restricted sense. We speak, therefore, of presentation of the head, of the breech, of the shoulder, and so on, as representing the part which occupies the os uteri. The presentations may be multiplied to any extent, as there is scarcely a single point on the surface of the child's body which may not, under certain circumstances, present. In proceeding to the consideration of the various presentations which it is necessary specially to describe, and remembering the position and attitude of the fœtus within the womb, we recognize the fact that it forms an irregular oval. By either end of this oval the delivery may take place naturally, so that we may consider as Natural Presentations all the varieties known as cranial, breech, knee, and footling cases. When the child lies transversely, the shoulder, or some other part of the superior extremity,—or, in other words, the side of the oval,—presents; and as those cases can rarely be terminated by the unaided efforts of nature, they may be termed Faulty Presentations. The following table, which is given by Dr. Churchill, will give some idea of the relative frequency of the various presentations, as deduced from the practice of different individuals:

Author.	Total No. of Cases.	Head Presentations.	Breech Presentations.	Inferior Extremities.	Superior Extremities.
Mad. Boivin, . . .	20,517	9,810	372	238	80
Mad. Lachapelle, . .	15,652	14.677	349	255	68
Dr. Joseph Clarke, .	10.387	9,748	61	184	48
Dr. Merriman, . . .	2,947	2,735	78	40	19
Dr Granville, . . .	640	619	2	3	1
Edinburgh Hospital, .	2,452	2,225	17	8	4
Dr Maunsel, . . .	889	786	...	21	4
Mr. Gregory, . . .	691	645	14	7	4
Dr. Collins, ...	16,414	15,912	242	187	40
Dr. Beatty, ...	1,182	1.105	28	15	4
Mr. Lever, ...	4.666	4,266	59	29	12
Dr. Churchill, . . .	1,640	1,119	35	22	9
Drs. McClintock and Hardy, ...	6,634	5,815	140	61	26
Drs. Sinclair and Johnston, . . .	13,748	11,874	309	181	60

The enormous preponderance of cranial over all other presentations renders a study of the former by far the most important. We shall, therefore, in the first place, direct our attention to the different varieties of cranial presentations. In respect of the difficulties which the student will encounter, in his endeavor to master this subject, it has already been confessed that these are not inconsiderable. But it is only at the outset that real difficulty will be met with. With every case we observe, and every minute we devote to the subject, what seems almost insurmountable at the first glance will melt away. More and more clearly, as we grapple with the minor difficulties which now arise, do we discern the great truths upon which the science and art of obstetrics depend. Having once fairly mastered the subject, we can never forget it, and so habitual and automatic will our observations become, that we shall find ourselves unconsciously adding to our stock of knowledge, and storing up valuable facts which will stand us in good stead in many an hour of difficulty and danger. But, if the student, at this period of his career, fails to acquire the requisite amount of knowledge which enables him to perfect the *tactus eruditus*, he will most likely never rise beyond a certain point in obstetrical and scientific knowledge. Success after a fashion he may reach, but his attainments will never much surpass those of an intelligent midwife. Once more, therefore, we would urge upon the beginner, with what emphasis and earnestness we can command, to lose no opportunity of acquiring sound knowledge on so important a subject. Without it, the practice of midwifery is weariness and drudgery; with it, it is a subject of constant interest, worthy of, and affording ample scope for, the highest scientific acumen.

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[1] To examine critically the views of Naegele on this subject would involve the introduction of controversial matter quite unsuitable to a systematic treatise. We feel, however, that Naegele's views have such a hold on British obstetrics, and demand, as well as deserve, such earnest consideration, that we do not consider ourselves justified in passing over with a simple denial any statement to which he has lent the weight of his great authority. We reproduce, therefore, in the form of an Appendix, the reasons which have induced us to reject Naegele's dictum on this point. (See Appendix.)

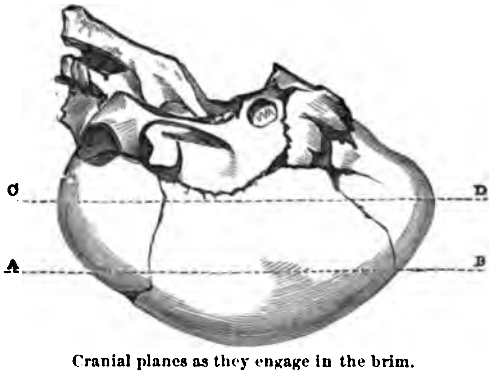
As the occipito-frontal or long diameter of the child's head *may*, in a presentation of that part, lie at the brim of the pelvis in the conjugate, oblique, or transverse diameter, or in any diameter intermediate between these, the number of Cranial Positions may be multiplied to any conceivable extent. Admitting the possibility of all of these, we at the same time recognize the fact, which Solayrés de Renhac has so clearly demonstrated, that the occipito-frontal diameter of the head of a mature child enters a normal pelvis in one or other of its oblique diameters. This admits of but four cranial positions, depending upon the direction in which the poles of that diameter are turned. In two, the occiput is turned forwards; and, in two, it is directed backwards: these are called respectively Occipito-Anterior and Occipito-Posterior. Four Positions, therefore, are described, which are termed First, Second, Third, and Fourth:

Occipito-Anterior,	*First Position,*	Head in Right Oblique Diameter; forehead backwards.
	Second Position,	Head in Left Oblique Diameter; forehead backwards.
Occipito-Posterior,	*Third Position,*	Head in Right Oblique Diameter; forehead forwards.
	Fourth Position,	Head in Left Oblique Diameter; forehead forwards.

First Position.—The head of the child, which occupies generally, above the brim, a position approaching the transverse, with the face to the right, assumes, as it enters the pelvis, in the great majority of cases, what is called the first position. The centre of the occiput is turned towards the ilio-pectineal eminence on the left side, while the forehead is directed to the right sacro-iliac synchondrosis. The long diameter of the head thus lies in the right oblique diameter. So soon, however, as the head encounters resistance in its descent towards the cavity, its long diameter ceases to be parallel with the plane of the brim, and nothing can be clearer and more obvious than the advantage which is thus obtained. For this *occipito-frontal obliquity* not only involves the passage of the occiput in advance of the forehead, in a degree proportionate to the amount of resistance, but, involving as it does a flexure of the neck, it thus enables the propulsive force to operate at a greater mechanical advantage, so soon as the chin becomes applied to the sternum. It is, in fact, the *vis a tergo* which causes the obliquity, as is most admirably described by Solayrés in his account of the position which we are now considering. The propulsive forces which impel the fœtus so situated, are communicated, in the first instance, to its vertebral column, the articulation of which with the base of the skull is much nearer the occipital than the frontal pole of the long diameter. This of itself, supposing the resistance to be equal all around, would be sufficient to cause the occiput to take precedence of the forehead; but the movement is further encouraged by the curving of the spinal column through which the force is transmitted.

No term in midwifery is more loosely used than the expression, "at the brim." In reference to this, we observe that the head, in passing the brim, offers, first, the vertex,[1] then its transverse or biparietal measurement, and lastly, its long or occipito-frontal diameter, so that although a considerable portion of the cranium has passed the brim, and consequently occupies the cavity, it cannot be said to have cleared the brim until the occipito-frontal diameter has passed. A reference to Fig. 101 will render this more intelligible, the line A B there indicating the biparietal plane, and that which is marked C D the occipito-frontal plane, which cannot pass the brim until the former has descended some little way into the cavity. The occipito-frontal obliquity, or flexion of the head, no doubt, disturbs in some measure the idea thus

FIG. 101.



Cranial planes as they engage in the brim.

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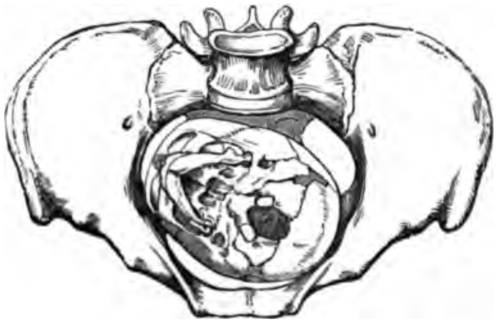
[1] For definition of this term, see p. 134.

expressed, but this, we believe, can only take place when the resistance is considerable, and occurs at an earlier stage than usual. We hold the head, therefore, to be "at the brim," in the proper sense of the term, when the long diameter occupies its plane; but as this can only be approximately ascertained, it cannot be held as a definition which is practically satisfactory. It is better, however, than using the term, as many seem to do, without attaching to it any clear meaning whatever.

While the head occupies the position indicated in Fig. 102, which we assume to be at the brim—and in which flexion has not as yet occurred—it is scarcely likely that what we have described as the first stage of labor has, as yet, terminated, or even that the os has reached such a degree of dilatation as to admit of a thorough vaginal examination. In making such an examination at this time, the first point to be remembered is the relation which the finger bears to the uterus and its contents; for most incorrect views will inevitably be adopted if we overlook the fact that the axis of examination forms, with the axis of the uterus and that of the brim, pretty nearly a right angle. The part of the fœtal cranium which is lowest in the pelvis, and which the finger first touches, is the right parietal bone in the neighborhood of its tuber.[1] But, if the finger be pushed further back, so as to reach the point on the surface of the fœtal cranium through which the axis of the brim may be presumed to pass, we shall find that this corresponds to some point in the line of the sagittal suture, nearer to one or other fontanelle in proportion to the degree of flexion.

FIG. 102.



First cranial position.

The descent of the head is not, in the first part of its course, in a direction which is identical with what has been described as the axis of the pelvic canal. Its movement is, in fact, directly downwards and backwards in the axis of the brim, until it approaches the floor of the pelvis, and experiences the resistance to its advance arising from the gradual approximation of the ischial planes. Upon the degree of flexion depends entirely the extent to which the occiput is in advance of the forehead. The further dilatation of the os uteri, and the rupture of the membranes, now usually admit of more exact observation by the finger, by which the sagittal suture will be found traversing the pelvis obliquely in the right oblique diameter. In the position in which the woman is lying, therefore, we trace this suture downwards and forwards for a short distance, to a point within easy reach of the finger, where it divides into two branches. This indicates the posterior fontanelle, which the pressure generally renders indistinguishable as a fontanelle by approximation and overlapping of the bones. The two branches are the lambdoidal suture. Following the sagittal suture in the contrary direction, and with reference still to the position of the patient, the finger travels upwards and backwards towards the right sacro-iliac synchondrosis. It requires some effort to reach the anterior fontanelle, not only on account of its being situated posteriorly in the pelvis, but on account of the flexion, which removes it further from our reach. Very generally, it can only be reached by subjecting the woman to some pain; but it is easily recognized by its size and shape, and by the four sutures which run into it. If the right ear can be reached behind the symphysis without causing unnecessary suffering, the direction of its lobe at once reveals the position of the head.

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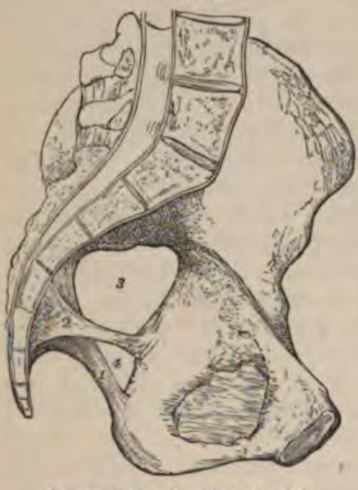
[1] This is one of the points upon which Naegele founded his belief in the existence of biparietal obliquity. Our reasons for dissenting from this view are fully given in the Appendix.

In consequence chiefly of the approximation of the sides of the pelvis which has been mentioned, the head now undergoes a change in its position. This is effected by the movement which was described by Smellie, and which is known as the *Rotation* of the head. This rotation, which is effected gradually, brings the antero-posterior diameter of the head into, or nearly into, the conjugate of the pelvis, so that the occiput looks forward to the subpubic angle, and the forehead backwards to the hollow of the sacrum. The recession of the anterior lip of the os beyond the advancing head admits of an easy examination of this process, which an observer may demonstrate for his own satisfaction by keeping his finger for a time in contact with the head. As he does so, he will often observe, as the head advances and recedes with successive pains, that the degree of rotation is greatest at the height of a pain, while, as the pain passes off, the head resumes its former position. The movement may thus be compared to that of a screw, the action of which is alternately direct and reversed. That nature provides for this rotation of the head in labor is made manifest by an examination of the relative measurements of the brim, cavity, and outlet of the pelvis. A question which has given occasion for much speculation is the mechanical cause of the rotation. The head, if maintaining its original direction, would simply be arrested at the outlet of the pelvis, its further progress, if of average size, being impossible. In virtue of what law, then, does it so invariably rotate?

Some have professed to recognize in the womb itself a rotatory power (*vis vertens*) by means of which the rotation of Smellie was effected. Others have studied most industriously the mode of action of the various muscles which line the pelvis, believing that in this direction the solution of the problem is to be found; and by one accoucheur of eminence—Flemand of Strassburg—it was supposed that the action of the obturator internus and pyriformis muscles was the cause upon which the phenomenon in question depends. Modern investigation has, however, proved that it is due to the nature of the opposing force which exists at the floor of the pelvis. If we look at the internal lateral surface of the pelvic cavity, as it is here represented, we observe that the tip of the ischial spine is the point which encroaches furthest upon the transverse measurement of the pelvic canal. The head, therefore, as it descends in the right oblique diameter, in the position which we are now studying, arrives at the floor of the pelvis with the occiput in front of the left ischial spine and, as a consequence, the forehead behind the right spine. Rotation backwards of the occiput or forwards of the forehead is thus effectually prevented. As the propulsive stage advances, the occiput is conducted downwards and forwards by the inclined plane formed by that portion of the ischium which is in front of and inferior to its spine, and by the obturator internus muscle; while on the other side of the pelvis, and on a higher level, the forehead is directed by the yielding sacro-sciatic ligaments towards the hollow of the sacrum. These two surfaces, then, are inclined planes which constitute the female screw, while the male screw is represented by the child's head; and we fully agree with Dr. Tyler Smith, that "the key to the pelvic mechanism, in an obstetric sense, may be said to be the spinous processes of the ischia." Some writers, it may be here observed, describe a posterior inclined plane of the ischium, which is separated from the anterior by an imaginary line leading from the spine of the ischium in the direction of the ilio-pectineal eminence. (See Fig. 15, p. 44.) This they suppose to act, in reference to the forehead, as the anterior plane does with the occiput. No such action can, however, be performed by this plane, as the forehead impinges upon the spine and margin of the great notch, and is at once conducted to the ligaments along which it glides.

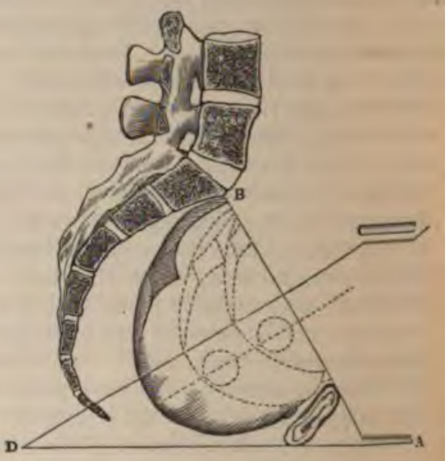
We have already used the term "Presentation" in its broader signification. There is, however, another sense, in which it is employed by all British and American obstetricians, which here calls for some special notice, as there unfortunately obtains, in regard to this, as well as other terms in English midwifery, the objection that each writer is left to attach to it his own meaning. The Presentation, in the second and more limited sense, is not the part of the child, but the actual "point" on its surface which presents, and, if it be wished to express this correctly, we do not know of a more accurate definition of the term than that given by Professor Hodge, of Philadelphia, who describes it as "that portion of the fœtal ellipse which is recognized toward the centre of the canal of the pelvis and vagina." This is practically the same as that of Dr. Matthews Duncan—"that point on the surface of the child's head through which the axis of the developed pelvic canal passes." But while admitting these to be mathematically more correct, we must own to a preference for the meaning which is attached to the word by Dr. Tyler Smith, who defines it as "that portion of the fœtal head felt most prominently within the circle of the os uteri, the vagina, and the ostium vaginæ, in the successive stages of labor." When the dilatation of the os uteri proceeds with unusual slowness, owing to rigidity, or premature rupture of the membranes, the *caput succedaneum* forms upon the scalp. Under such circumstances, that swelling will be found to occupy, altogether or mainl the right parietal bone. This is, however, no evidence of bipariet obliquity, as the swelling occurs, in obedience to the laws of gravit in the direction of the vagina, where the resistance is least. It is onl

FIG. 103.



Internal lateral surface of pelvis.

FIG. 104.



however, under circumstances of exceptional resistance, that the swelling alluded to becomes developed at this stage.

While the head is undergoing the rotary process above described, no change whatever takes place in the parallelism which exists between its transverse diameter and the plane of the brim. *Quâ* the *cavity* of the pelvis, the right side is certainly lower; but this is a very different matter from what is asserted by the followers of Naegele.[1] So soon as a certain amount of rotation has occurred, the vertex descends quite to the floor of the pelvis. The head now becomes exposed to a set of forces quite distinct from those which have, up to this time, been the sole cause of its movements. The tissues which form the floor of the pelvis, although they yield, to some extent, before the advance of the head, constitute, by their resiliency, an opposing force, which, while it effectually bars the further advance of the head in that direction, determines a motion which is the resultant of this and the force from above, and, being intermediate in its direction between these, is consequently downwards and forwards. Solayrés calls this a *reflected* force, and describes the mechanism in the following graphic terms: "Hujus motûs rationem haud immerito contuleris cum eâ, quæ nucleus prementes digitos fugit." An illustration of this is familiar to every schoolboy who has propelled a cherry-stone fresh from the fruit by pressing it between his fingers.

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[1] This is roughly indicated in the diagram here given. Fig. 104 shows the great amount of lateral obliquity, in reference to the horizon, of the head advancing in the first position in the axis of the brim, the centre of the sagittal suture being exactly midway between the promontory of the sacrum and the symphysis pubis. It shows, also, how, during the whole of this stage of labor, the right parietal protuberance may be described, in general terms, as the part which first meets the finger, or as lowest in the pelvis, advancing, as it does, in the direction of the dotted line, parallel to the axis of the brim. If the head were in the transverse position, the sinking of the parietal protuberance would be still more decided.

A B. The plane of the brim, meeting the horizon at an angle of 60° at *A*.

C D. The axis of the brim, passing through the centre of the sagittal suture and the coccyx, and meeting the horizon at *D*, at an angle of 30°.

As the forehead of the child has, in its course along the back part of the cavity, to traverse a curve which is of much greater extent than the posterior surface of the pubis, we would anticipate what actually does take place,—viz., that the chin, before the completion of the movement of rotation, leaves the breast, and that the anterior pole of the occipito-frontal diameter descends, as regards the brim-plane, considerably in advance of the other,—this motion being again reversed, at a more advanced stage, as we shall see presently. The successive changes which thus occur in the obliquity of the long diameter are well expressed by Dr. Murphy, when he says that the head may, in the course of labor be described as "oscillating on its transverse measurement."

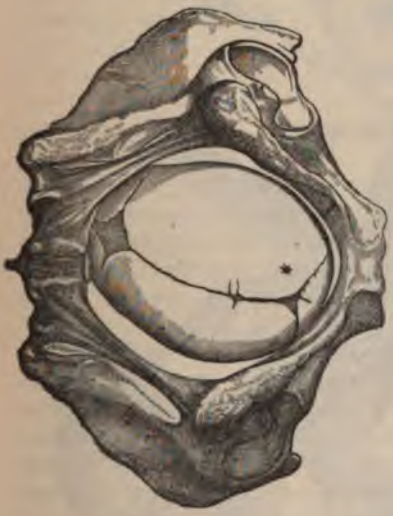
From the time at which the head comes under the influence of the reflected force of Solayrés, its general direction is altered, and now corresponds pretty closely with the axis of the vagina. The vagina, or what, in its altered anatomical relations, we may more appropriately call the lower portion of the parturient canal, has a curve for its axis, which we have already demonstrated (p. 42) as continuous with the axis of the bony pelvis. The general direction of this is downwards and forwards, so that the head may be assumed now to move in a direction which forms an approach to a right angle with its original course. The pressure of the head upon the perineum gradually effects the dilatation of the terminal portion of the canal. The left division of the os frontis, in the immediate vicinity of the fontanelle, or the contiguous portion of the parietal bone, presses upon the coccyx, which moves backwards to the extent of an inch, in order to permit of the passage of the child. If the pelvis is at all under the average in point of size, the frontal region is arrested at the apex of the sacrum, and the occipital end of the lever is again driven downwards, so as to press upon and distend the perineum. If, however, the parts be ample, and the perineum not unduly resistant, this does not occur, and the whole bulk of the head follows the curve of the sacrum at every pain, obviously attempting to effect an exit immediately under the pubic arch.

From the above descriptions it is apparent that the occipito-mental or longest diameter of the child's head is never at any time thrown across the pelvis. Indeed, if the flexion of the head is great, Dr. Hodge is not far from correct when he describes it as coinciding with the axis of the brim. The moment now approaches, however, at which a new movement must be executed, that of extension, and it is difficult at first to see how this can be effected without the extreme diameter being turned into the conjugate of the outlet. Nature fortunately does not attempt this movement until the occiput is passing upwards in front of the symphysis pubis in the act of birth. The motion of extension is the reverse of the flexion which has been mentioned as one of the earlier mechanical phenomena of labor. The oscillations which the head in its course undergoes on its transverse axis are—first, flexion; then partial extension prior to rotation; then flexion, if the forehead is arrested at the apex of the sacrum; and finally, the movement of exaggerated extension, which is only completed with the birth of the head. The occipito-mental diameter is not at any moment thrown across, and is only released when its occipital pole is born. The occiput, vertex, forehead, face, and chin successively sweep over the distended perineum, the head continuing its curved axis of motion, and being born upwards and forwards in front of the mons veneris.

Before Naegele wrote, it was universally believed that the head was born with its antero-posterior measurement accurately corresponding to the conjugate diameter of the outlet. A considerable number of distinguished modern obstetricians still hold this view, and it is certain that, in a large number of instances, the head is so born. The Heidelberg professor taught, however, that the head did not pass into the world after this fashion, but that there existed at the outlet a certain amount of pelvic obliquity, as the forehead did not rotate altogether into the hollow of the sacrum; and he showed, in addition, that a certain degree of biparietal obliquity is maintained, according to which the right parietal protuberance is, in the first position, born in advance of the left, so that the caput succedaneum is at this stage formed upon the superior and posterior quarter of the right parietal bone, close to the posterior fontanelle. That both of these obliquities generally occur, in what we may call a typical case of normal parts and moderate perineal resistance, we believe; but, in asserting that they are essential phenomena, such as are the movements of Flexion, Rotation, and Extension, the celebrated author committed an error which his followers have but too faithfully copied. For these obliquities are of comparatively trifling importance, and should never have been bracketed with the other and really important movements. Until he has fully mastered the latter, we should advise the student to take no note of these obliquities. The most recent writers on the subject (Küneke, Hodge, and Duncan) all dispute the conclusions of Naegele and argue in favor of the parallelism, or, as they term it, "Synclitism," of the biparietal and cervico-bregmatic planes of the child's head, with the planes of the pelvis and the vagina. With reference to the observations of Professor Hodge, it may be remarked that he, his celebrated predecessor Dewees, and, we may add, the American obstetrical school generally, have long repudiated many of the doctrines of Naegele which are still taught in English text-books. Fig. 105 shows the relation which the head, when about to pass in this position, bears to the pelvic structures.

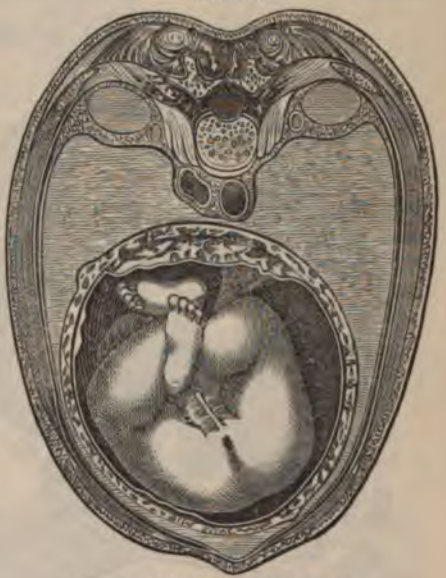
No sooner is the head born than another rotation takes place—the face of the child turning spontaneously to the right thigh of the mother. This is due to the manner in which the shoulders descend. In Fig. 106 we are looking downwards into the cavity of the uterus. It will be observed that the broad, or transverse diameter of the shoulders and the breech occupy the left or opposite oblique diameter to that in which the antero-posterior measurement of the head is descending. Upon the birth of the head, the shoulders encounter the same difficulty from the ischial spines; and, as the rotation must be such as to bring the anterior shoulder, as it did the occiput, under the pubic arch, the left or posterior shoulder revolves into the hollow of the sacrum. This movement of the shoulders takes place, therefore, in a direction which is the reverse of the previous rotation of the head; so that we may, with perfect propriety, look upon the head as resuming the oblique position which it originally held in reference to the pelvis. It has, on this account, been well called the movement of Restitution. There is another phenomenon which should not here be overlooked, inasmuch as it exercises no inconsiderable influence on the progress of labor. This is the moulding of which the head is susceptible, without any risk to the child. The amount of moulding is, of course, proportionate in a great measure to the resistance, but the head, when born, presents, in every instance, a shape which gives it a peculiar, elongated appearance, and, in cases where the caput succedaneum is much developed, this is still further exaggerated. The moulding and pointing of the occipital region is the *Hinterhauptspitze* of the Germans; and the form presented is, as will be shown in the sequel, very different from that which is produced in occipito-posterior positions. As soon as the shoulders have escaped, the mechanical difficulties of delivery may be said to have terminated; for the extent to which the parts have been dilated during the birth of the head, will have rendered them more

Fig. 105.



The head approaching the outlet.
First position.

Fig. 106.



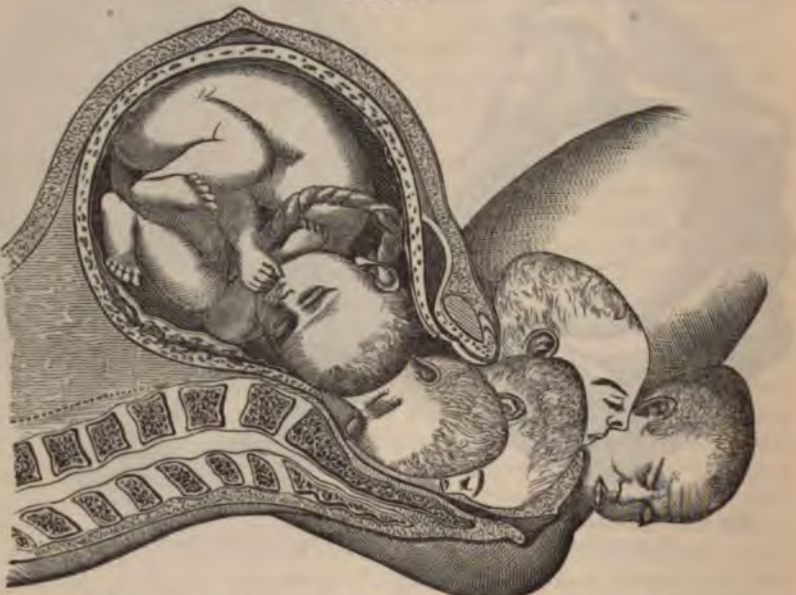
First position as seen from above.

than sufficient for the egress of the parts which remain. The Placenta escapes edgewise, folded, as formerly described, and not inverted, as is usually asserted.

We have, in the above description of the first position, gone pretty fully into detail, in order that the other three positions may be more easily understood. We would recommend the student, before attempting any practical investigation of the facts which have been set forth, to follow the description with the bones in his hand—by which means only can he thoroughly understand the subject, to the extent which is essential as a preliminary to the intelligent examination of the phenomena of actual labor.

The figure here shown indicates, diagrammatically, the various positions which the child occupies during the successive stages of labor, as just described. The representation is supposed to be of a woman from whose body the right half has been removed, leaving the fœtus alone untouched.

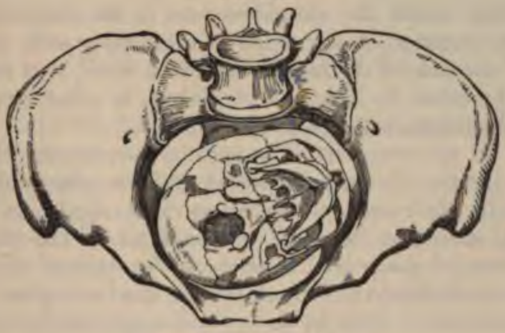
FIG. 107.



Diagrammatic representation of successive stages of the first position.

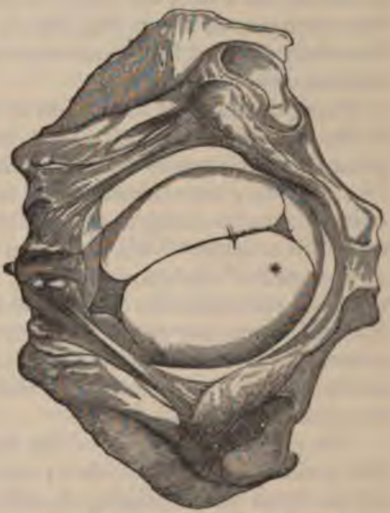
Second Position.—This is the converse of the First. As the head enters the brim of the pelvis, the occiput is turned towards the right ilio-pectineal eminence, the forehead being directed to the left sacro-iliac synchondrosis. This, therefore, like the first, is an occipito-anterior position, the only difference being that it occupies the left oblique diameter instead of the right. It is the left side of the head which presents, and the neighborhood of the left parietal protuberance is, therefore, the part which the finger first reaches in a digital examination. The sagittal suture corresponds to the left oblique diameter, so that when the woman is on her left side, the finger passes upwards and forwards, to reach the posterior fontanelle, and downwards and backwards to reach the anterior. The occipital pole of the antero-posterior diameter of the child's head is, as in the first position, driven downwards in advance of the other. It glides, during the rotation which succeeds, in a direction downwards and forwards, along the ischial plane on the right side, towards the subpubic arch, while the forehead moves from left to right, along the left sacro-sciatic ligaments, towards the hollow of the sacrum. The head, after complete rotation, and sufficient distension of the perineum, approaches the orifice of the parturient canal, in a position which generally approximates that shown in the annexed figure (Fig. 109), in which a certain amount of left obliquity still exists, and the left parietal protuberance is a little in advance. The face, upon its birth, turns towards the left thigh of the mother, while the shoulders, after passing the brim in the right oblique diameter, are rotating so as to bring the left shoulder under the pubic arch.

FIG. 108.



Second cranial position.

FIG. 109.



Second cranial position at the outlet.

With reference to this external rotation of the head, it must here be remarked,—and the observation applies equally to first and second positions,—that the rotation described, in each case, while the rule, is a rule which admits of exceptions. It is, no doubt, true, that an observation of the external rotation of the head may generally be received as evidence—confirmatory, or the reverse—of the diagnosis which we may previously have formed as to its position in the pelvis. But this is by no means invariable, as sometimes, in undoubted first positions, the face rotates to the left, and in second, to the right; the direction of the movement in each of these cases being a continuation, by the shoulders, of the same screw motion previously performed within the pelvis by the head. Occasionally, as Naegele admits, and probably in cases where the diameters are greater than usual, the shoulders pass in the transverse diameter, and there is no rotation at all; while in cases rarer still, as is described by Schmitt, "the face of the born head turns itself, first to the one side and then to the other, as if to ask of Nature in what direction the descent of the shoulders could best take place."

Once more let us recapitulate the various movements which the head undergoes in the two Occipito-Anterior positions above described, and note very briefly their mode of action as mechanical aids to labor:

The general direction followed by the head of the child from the brim to the floor of the pelvis, is that of the axis of the brim. The longer diameter of the oval formed by the head occupies one or other oblique diameter, as it finds in these the longest measurement.

By the antero-posterior obliquity of the head not only is the occipito-mental diameter prevented from lying, by any possibility, across the pelvis, but the occipital pole of the occipito-frontal is so depressed that a further and obvious mechanical advantage is gained. This is otherwise called the Flexion of the head.

Rotation is a movement of the head upon its perpendicular axis, according to which its longer diameters are moved into, or nearly into the conjugate of the pelvis, which is at this stage the most ample. This is mainly effected by the anterior ischial planes, and the yielding of the sacro-sciatic ligaments.

The movement of extension is that which occurs at the moment of birth, its most important object being to admit of the passage of the great occipito-mental diameter without injury to the perineum. It is, like flexion, a movement of the head on its transverse diameter. The chin leaves the sternum of the child as it descends through the pelvis, a certain amount of flexion again occurring if there is much resistance at the apex of the sacrum, but it is only when its head is passing the external parts that the exaggerated movement occurs to which the name Extension has *par excellence* been given. The general direction of the movement, from the time the head reaches the floor of the pelvis, is downwards and forwards, but the head follows the parabolic curve of the axis of the passage.

The obliquity (pelvic) of the head at the outlet is probably due to the position of the shoulders; the biparietal obliquity is accounted for by the head still retaining something of its original parallelism to the plane of the brim. Neither are of much importance, but the latter, by permitting one parietal protuberance to precede the other, diminishes, to a slight degree, the circumferential measurement of the ostium vaginæ at the moment of its greatest distension.

The external rotation of the head is caused by the rotation of the shoulders in the opposite oblique diameter to that which was occupied y the head. As the result of this is to restore the head, by a movenent on its perpendicular axis, to its original position, it has been called he movement of Restitution.

CHAPTER XVIII.

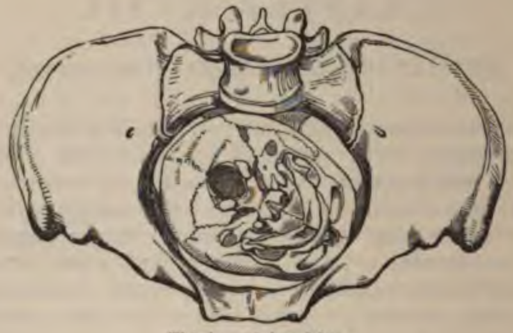
MECHANISM OF LABOR—(CONTINUED).

CCIPITO-POSTERIOR POSITIONS—THE THIRD POSITION; ROTATES INTO THE SECOND, OR MAY TERMINATE WITH FOREHEAD FORWARDS—THE FOURTH POSITION; ROTATES INTO THE FIRST, OR MAY TERMINATE WITH FOREHEAD FORWARDS—ARTIFICIAL RECTIFICATION OF THESE POSITIONS—COMPARATIVE FREQUENCY OF THE FOUR CRANIAL POSITIONS. FACE PRESENTATION—DISTINCTION BETWEEN "OBSTETRICAL" AND "ANATOMICAL" FACE—MENTO-POSTERIOR AND MENTO-ANTERIOR VARIETIES—FOURTH POSITION: MECHANISM OF—THIRD POSITION—FIRST POSITION; ROTATES INTO THE FOURTH—SECOND POSITION; ROTATES INTO THE THIRD—RELATIVE FREQUENCY OF FACIAL POSITIONS—OPERATIVE INTERFERENCE IN CASES OF FACIAL POSITION—IRREGULAR POSITIONS—TABULAR COMPARISON OF CRANIAL AND FACIAL POSITIONS.

IN the two remaining, or Occipito-Posterior positions, the head lies as in the former, in one or other of the oblique diameters, so soon as it fully occupies the brim. The reversed position, however, of the frontal and occipital poles of the long diameter of the head here renders necessary the application of mechanical principles, which in some respects differ very widely from those which have been explained as accounting for the phenomena attendant upon delivery in the occipito-anterior position. This becomes to some extent obvious upon an examination of the cranium itself, and by a comparison of the broad, unyielding forehead with the pointed, compressible occiput. But if we observe further the relaxation which the pelvic cavity bears to possible movements of flexion and rotation, it will at once become apparent that in these positions nature has difficulties to overcome in comparison with which those attending the occipito-anterior positions are probably trifling. What these special difficulties are, we shall attempt to show, noting carefully, at the same time, the means which nature adopts to overcome the impediments which thus arise.

Third Position.—The head in this case enters the brim of the pelvis in the right oblique diameter, with the forehead turned towards the left ilio-pectineal eminence and the occiput to the right sacro-iliac synchondrosis, as shown in the accompanying figure. On a digital examination, it is the left parietal bone which the finger touches in the neighborhood of its protuberance, at a point usually a little anterior to that reached in the second occipito-anterior position. With reference to the posture of the woman, the sagittal suture is traced downwards and forwards, where it ends in the large lozenge-shaped anterior fontanelle, while in the contrary direction it may be followed upwards and backwards to where it terminates in the posterior fontanelle. This point is of paramount importance in the diagnosis of the position, for when, in any case, we find that the great fontanelle is within easy reach of the examining finger, our suspicions should at once be excited, and the nature of the position carefully ascertained.

FIG. 110.



Third cranial position.

So soon as the head becomes engaged in the brim, one of two things may occur. In the one case the occiput is driven, by the propulsive force communicated through the spinal column, downwards in advance of the forehead, as in occipito-anterior cases; in the other the occiput is arrested, and the force being thus transferred to the frontal pole of the long diameter, that pole precedes the other in its descent. Whether the forehead or the occiput thus descends, there is, in the great majority of cases, no barrier to the termination of the labor by the unaided efforts of nature, although such cases are more or less protracted. When the head, therefore, is placed in the third position, the labor may terminate in two ways, either by rotation into the second position or by the forehead passing under the pubis. As the former is the rule, and the latter a somewhat rare exception, we shall first consider the mechanism according to which, in the great majority of cases, such labors terminate.

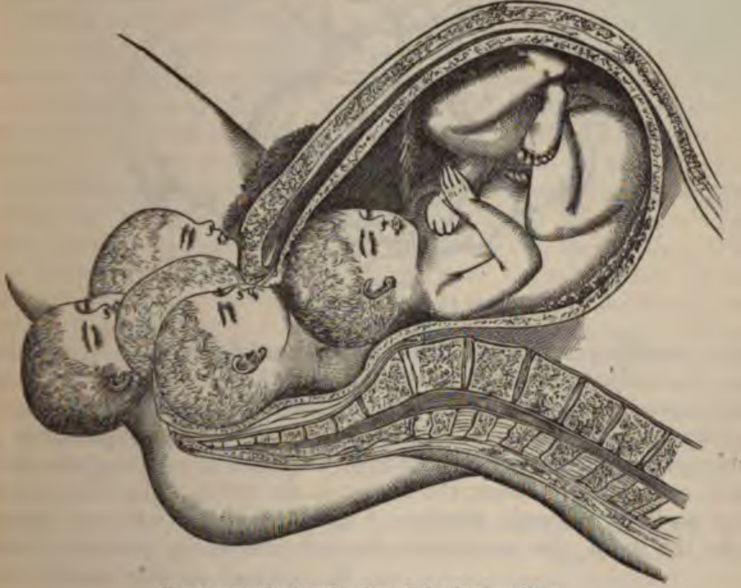
The natural termination of the third position is by a movement which in extent far exceeds the ordinary rotation of the head. The facility with which this occurs depends in no small measure upon the capacity of the pelvis. For nothing is more essential, as a preliminary to this movement, than an easy descent of the occiput in the direction of the right sacro-sciatic ligaments, whereas, any difficulty which may exist, from peculiar formation, or contraction of any of the diameters, may, by arresting this initiatory movement, favor the descent of the forehead. The more marked the flexion of the head, therefore, and the nearer the posterior fontanelle to the examining finger, the greater is the confidence with which we anticipate a natural and satisfactory rotation. If, as is very frequently the case, the head descends quite to the floor of the pelvis before rotation has occurred, the depression of the occiput and corresponding recession of the forehead are still the signs which point towards rotation. For, in this situation, the forehead, which occupies the anterior inclined plane of the ischium on the left side, cannot, on account of the approximation of the ischial spines, rotate directly in the same pelvic plane. It is essential, therefore, that the forehead should be elevated above the spine of the ischium, and the antero-posterior diameter of the head thus shortened in reference to the pelvic planes. This is precisely what is effected by flexion at this stage; and if we watch the process with the finger, we observe, in the first instance, that the anterior fontanelle recedes from our finger in the direction of the horizontal ramus of the pubis. The posterior fontanelle descends and comes within easy reach, until the flexion is so complete that the occipito-mental diameter approaches the axis of the brim. A rotatory or screw motion of the head now becomes manifest, the forehead moving upwards and backwards on the left, and the occiput downwards and forwards on the right side of the pelvis during a pain; and the head resuming its former position during the interval. Presently, and often in the course of a single pain, it performs a rotation equal in extent to the quadrant of a circle; and if we now make an examination, we find that the head occupies what was described in the last chapter as the second cranial position. In its normal and natural course, therefore, *the third position rotates into the second.*

The rotation thus effected is remarkable not only in regard to the extent, but also in respect of the mechanism by which it is effected. If the mechanism were identical with what obtains in occipito-anterior positions, the forehead would, in every case, be directed by the ischial spine over the left ischio-pubic ramus towards the subpubic arch. But the mechanical result of pressure transmitted through the vertebral column is the same in all cases where the pelvic resistance is equal on all sides. The occiput being thus pressed down, the forehead rises as has been described, and the chin is approximated to the sternum. A point is presently reached at which the whole forehead has risen above the level of the ischial spine, and the rotatory movement commences. The occiput, on the other side, is beneath the right spine, and approaches the centre of the pelvis, being directed downwards and forwards, on the right side, by the corresponding margin of the sacrum and coccyx, and the sacro-sciatic ligaments. This is probably the cause of the first effort at rotation, but as soon as the forehead passes sufficiently far back to impinge upon the posterior ischial plane, it at once glides along this to the sacro-iliac synchondrosis, and the rotation is complete. Afterwards, the presenting point being as before a portion of the left parietal bone, the case goes on as if it had been from the first a second position, the only difference as affecting the progress of the labor being that that process has now to commence,—should it be required,—which consists in moulding of the parts, and which, under other circumstances, would already have been in some measure effected. From what has been said, it will be understood that the earlier and the more easy is the descent of the occiput, the more uninterrupted and satisfactory is the course of the labor: in such cases there is, in fact, no special difficulty, and no additional danger either to mother or child. But, in cases in which the forehead continues to descend, the difficulty of rotation is greatly enhanced, for in that case the preliminary flexion involves the necessity of the occipito-frontal diameter being thrown across the pelvis; and if the measurements generally are small, this can only be effected with considerable difficulty, a difficulty which is increased by a certain degree of moulding, and the formation of the caput succedaneum in an unusual situation. But, even these cases will usually terminate as second positions, more especially if a certain amount of assistance be afforded in a manner to be hereafter described.

In a small proportion of cases, but certainly much more frequently than Naegele and his followers would have us suppose, the rotation above described does not take place. The forehead, in these instances, sinks lower and lower in the pelvis, and the anterior fontanelle approaches still more closely to the ostium vaginæ. A very useful practical distinction was drawn by Dr. Uvedale West, of Alford, a veteran practitioner, who has devoted much earnest thought to the subject now in question. Dr. West, recognizing the flexion of the head as an essential element in rotation, proposed that those cases in which the frontal pole of the long diameter remains high, all of which end by rotation, should be called *bregmato-cotyloid,* while the others, which terminate, or threaten to terminate, with the forehead forwards, should be designated *fronto-cotyloid*—a simple distinction of unmistakable importance.

When the head assumes this fronto-cotyloid position in a well-marked degree, we may be pretty sure that it will end with the forehead forwards instead of the occiput. But we must not too hastily adopt this conclusion, as cases have been observed in which, at the last moment, when the part presenting had already shown itself at the external aperture, the forehead spontaneously moved up, and delivery was effected, after rotation, in the usual way. The attention of the accoucheur, should he have omitted to notice it previously, may be attracted by the fact that the labor is progressing in an unsatisfactory manner, and that the progress made is quite out of proportion with the expulsive force; and, on examination, he now recognizes the nature of the case with which he has to deal. At this time, the orbits and nose may be easily felt behind the pubes, and as labor progresses the forehead comes into view. Cazeaux says that the superciliary arch may sometimes be seen, and that on one occasion he saw the upper eyelid. Under the influence of powerful uterine contraction, the occiput is now driven downwards, the head executing thus tardily its movement of flexion. The perineum becomes distended to a dangerous extent by the posterior part of the head. This cannot be relieved, as in the ordinary position, by the movement forward of the occiput, to which the forehead offers no resemblance in shape. The presenting part moves, therefore, somewhat upwards, and to the left, until the occiput passes over the strongly distended perineum. The final movement is performed by an extension of the head—the nape of the neck, pressed against the anterior commissure of the perineum, being the centre upon which the revolution occurs, which brings the forehead, nose, mouth, and chin, successively from beneath the pubic arch. The motion at this point is precisely analogous to what obtains in first and second positions, where the centre of the motion is the subpubic angle, and the forehead and face sweep forward over the perineum. There is certainly in all such cases an increased risk of perineal laceration. The various stages in the mechanism of delivery in this position are shown in the accompanying diagram (Fig. 111).

FIG. 111.

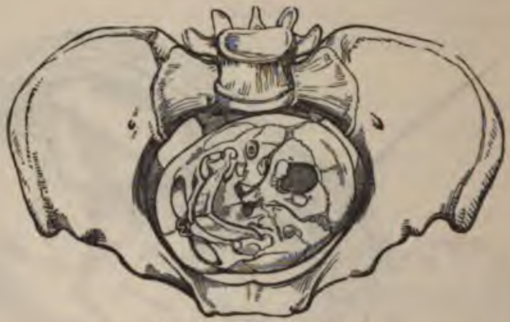


Fronto-anterior termination of the third position.

Another possible termination of occipito-posterior positions consists in a movement of extension, or rotation of the head on its transverse axis, by which the case is changed into a presentation of the face. And, moreover, as a rotation such as this would bring the chin forwards—which is, as we shall show, in a face presentation, a quite favorable position—we may assume that such an occurrence would be rather a favorable termination than otherwise to the cases which Dr. West terms *fronto-cotyloid*.

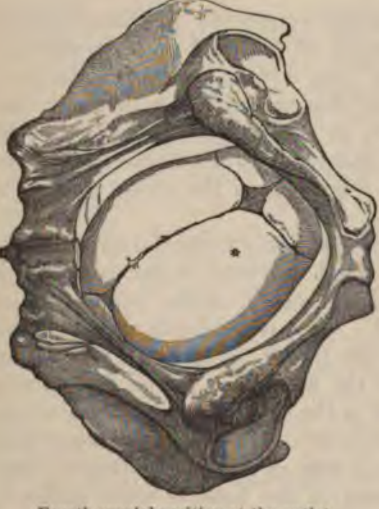
Fourth Position.—The head, in this position, enters the brim of the pelvis in the left oblique diameter. The forehead is turned towards the right ilio-pectineal eminence, and the occiput to the left sacro-iliac synchondrosis, as shown in Fig. 112. On a digital examination, it is the right side of the head which the finger touches. The sagittal suture, in reference to the posture of the woman, is traced downwards and backwards to where it terminates in the posterior fontanelle, while, in the contrary direction, the finger follows it upwards and forwards to the anterior fontanelle. The opinion is very generally entertained that, in the fourth position, the engagement of the head is more difficult, and its rotation slower than in the third. It is impossible to avoid the conclusion that this is due, in a great measure, if not entirely, to the rectum, which, by encroaching upon the left oblique diameter, renders it less capacious than the right. The fourth position being the converse of the third, as the second is of the first, we find the description of the one will serve, *mutatis mutandis*—reading right for left, and so forth—in every respect for the other. It may thus terminate in two ways, according as the occiput or the forehead descends. In the former case, the occiput passes below the left, and the forehead above the right ischial spine, so that *the fourth position rotates into the first* in the natural and normal course of such a case, and ends with the occiput under the pubic arch as usual, the right side of the head thus being, during the whole course of the labor, the lowest in the pelvis. In this, as in the third position, a certain number of cases terminate with the forehead under the pubis, the mechanism, in each case, being precisely similar, the occiput usually passing over the fourchette, whereupon the forehead, nose, and chin, sweep successively, backwards and downwards, from behind the pubic symphysis. The position of the fœtal head in reference to the outlet of the pelvis is shown in the engraving. If we admit the possibility of conversion of a third position into a face case by rotation on the transverse axis of the head, we must also admit it in the case of the fourth position. And it is worth noticing that such a rotation would directly, and without further change, convert the position which we are now speaking of into that position of the face which is most frequent in its occurrence. In all cases in which the forehead is born forwards, the ordinary process of moulding is reversed, and the head presents a very remarkable

Fig. 112.



Fourth cranial position.

Fig. 113.



Fourth cranial position at the outlet.

appearance, owing to the flattening of the occipital, and bulging of the frontal regions.

The comparative difficulty which arises from the situation of the rectum constitutes, therefore, as it would seem, the only practical distinction between third and fourth positions. All observers seem to have agreed in this—that, in the fourth, the rotation takes place as a rule, and probably, on account of this very difficulty, on a higher level as regards the pelvis; and that, if it descends to the floor of the pelvis with the forehead still directed towards the right obturator foramen, the chances of rotation at this more advanced stage are less than in the third. Rotation, at an early stage of labor, before it is yet practicable to ascertain the actual position of the head with anything like certainty, is probably of much more frequent occurrence than we have any idea of. Few things are more familiar to the experienced accoucheur than a rotatory or rolling movement of the head, which he observes either during a pain or an interval, while it is still high in the pelvis. This is due partly to uterine action, and partly to the movements of the fœtus, and we have no doubt that, by this means, many unnatural and faulty positions are rectified even after labor has commenced; and we are further entitled to assume that in this way many occipito-posterior positions are rectified at such a stage that their detection is rendered impossible. It should always be remembered that the dorso or occipito-anterior position of the child is the natural one, and that according to which the irregular oval which it forms is most conveniently disposed.

Recognizing, as we now do, the natural termination of third and fourth cases as second and first respectively, a very important practical point arises, which may perhaps be most conveniently discussed at this place. This is the possibility of rectification by artificial means of occipito-posterior positions, which are about to terminate, or threaten to terminate, with the forehead towards the pubis. No possible doubt can exist as to the fact that the position of the head may be, and often has been changed by the operations of the accoucheur. In confirmation of this assertion, we have the evidence of the most eminent obstetricians. More than a century ago, Smellie, after having repeatedly but in vain attempted to drag the head through in a case of this kind, bethought him of trying to turn the face backwards into the hollow of the sacrum. Success attended his first attempt—a result which "gave him great joy," and opened his eyes to a new field of improvement "in the method of using the forceps in this position." Clarke, Burns, and others, stated that rectification could be brought about in many cases by the use of the finger alone. Among accoucheurs of our own day, Drs. Murphy and West have emphatically expressed their views in favor of the feasibility of this proceeding.

As regards the period of labor at which rectification may be effected, we find that many writers assume, or at least imply, that the operation may be performed at any stage. The fact is, however, that the head cannot in ordinary circumstances be rotated until it has reached that stage of the labor where nature as a rule spontaneously induces the rotation, so that it will often be a matter of difficulty to say what share in the movement we are to award to nature and what we may claim as the result of our operative interference. The conclusion with reference to the subject at which we have arrived is that we may succeed in amending the position of the head in two classes of cases. In the first of these, the head is free at the brim, or at least has not as yet encountered any serious pelvic resistance; and here rotation may be effected by the forceps in a manner which will be more particularly alluded to when we come to speak of the uses of that instrument. In the second class of cases referred to, the head has reached the floor of the pelvis, where we have natural rotatory forces operating in our aid; but no attempt, while the head is in a position intermediate between these two, is likely to be attended with success.

The forceps are quite inapplicable to the class of cases last mentioned, for reasons which are obvious. The surest and safest guidance is to be found in a careful study of the mechanism by which nature at this stage effects the rotation. And, if we do so, it will soon become apparent that it is only by imitating or assisting nature that we can hope for success. If we attempt simple rotation, the ischial spines interpose a barrier which it is impossible to surmount; but, if we, on the other hand, take nature for our guide, and assist her in the direction which she indicates, we must employ our whole efforts in promoting the preliminary flexion of the head, which has been fully explained in our description of the third position. With this in view, then, we should press the forehead upwards, in the direction of the ilio-pectineal eminence, on the side in which it lies. This is done most effectively by bringing two fingers to bear upon it and pressing in the direction indicated during a pain. This, in the first instance, will probably have little effect in displacing the forehead, but if we can only succeed in preventing its further descent, we thus transfer in some measure the propulsive force to the occiput, and in a greater or less degree encourage the essential movement of flexion. After a time, the effect of this will probably become manifest in a recession of the frontal pole of the long diameter. But should the effort fail, we may, as Dr. West suggests, attempt to pull down the occiput by means of the instrument called the vectis, while continuing the pressure with the fingers as before. By one or other method, or by a combination of both, we may often succeed in effecting the natural flexion of the head, until the forehead is high enough to pass above one ischial spine and the occiput low enough to pass beneath the other, when nature herself will effect the actual rotation, and may be left to complete the labor without any further interference. Madame Boivin seems to have entertained the belief that, in the third position, something may be gained by emptying the rectum so as to facilitate rotation into the second; and that, as regards the fourth, a distended rectum is rather an advantage than otherwise, inasmuch as it would tend to prevent the movement of the occiput into the hollow of the sacrum, and so indirectly encourage the rotation into the first position, which we desire to promote.

While the four positions which have now been described are all which we think it necessary to specify in detail, there can be little doubt that, under exceptional circumstances, others may be met with.

The accidental position, for example, of the head in the conjugate or transverse diameters of the brim has, in the opinion of many approved authorities, warranted them in adding four more, making eight positions in all. We apprehend, however, that the mechanism, in such rare instances as may be met with of conjugate or transverse as primary positions, does not call for any special description, and that to admit them would be unnecessarily to complicate a subject already beset with sufficient difficulties. Both of the positions indicated would, in a normal pelvis, inevitably be resolved into one or other of those which have been described, and would thus terminate according to the laws which we have attempted to elucidate; while, if they were the result of abnormal disproportion of the parts, they would come under the influence of special laws, which it is no part of our object at present to explain. We take no notice, it will be observed, of premature birth or putridity of the fœtus, in which the child *may* pass in any diameter; but even here the tendency is to follow the natural course.

We have now to consider the subject of the Comparative Frequency of the cranial positions. It may be considered that this ought to have been referred to at a somewhat earlier stage. We have, however, purposely postponed it until now, as considerations arise, in reference to points not yet fully determined, which can only be understood by those who are in possession of the facts which have been detailed in this and the preceding chapter. It is to be regretted that no inconsiderable differences of opinion, on many of the points referred to, have arisen in consequence of the views of Naegele having been implicitly received, while yet they obviously lacked confirmation.

From the time of Smellie, the first position has been universally admitted as that which is by far the most frequent. Until the publication of Naegele's celebrated essay, there was a similar unanimity among obstetricians as to the second position being next in point of frequency to, and in all respects the converse of the first; but the effect of his researches upon the minds of all modern practitioners has been to modify greatly, and in most cases entirely to overthrow, the conclusions of his predecessors on this point. In order to avoid a mass of statistical details, we shall only attempt here to compare the conclusions of Naegele, and of those who agree with him, with the results attained by many modern observers who differ from him more or less widely. It is beyond doubt that his original doctrines are, to the present day, more fully believed in this country than in France, America, or even in Germany; and this is obviously due to the fact that many of our most eminent accoucheurs have taught and still teach these doctrines, while some believe that they have confirmed their accuracy by subsequent research. All this is shown in the following tabular analysis; but it is therein further made evident that there are many men of undoubted talent and experience who decline to accept the evidence even of Naegele as of greater weight than that of their own senses. The following table shows the percentage of each of the four cranial positions, as deduced from the published statistics of the observers quoted:

	First Position.	Second Position.	Third Position.	Fourth Position.	Not Classified.
Naegele, ...	70.	. . . .	29.	. . .	1.
Naegele, the younger,	64.64	. . . .	32.88	. . .	2 47
Simpson and Barry, .	76.45	.29	22.68	.58	. . .
Dubois, ...	70.83	2 87	25.66	.62	. . .
Murphy, ...	63.23	16.18	16.18	4.42	. . .
Swayne, ...	86.36	9.79	1.04	2 8	. . .

By means of this tabular arrangement, we see at a glance the extent to which, apparently, one observer differs from another, but we must look a little closer at the figures to discover their true import. In the first place, we may observe that the two Naegeles regarded the second and fourth positions as so exceptional that they did not include them at all in their system of classification, contenting themselves with the assertion that, when present, there were either some special circumstances which induced the irregularity, or that the observations were not made sufficiently early in the labor. The elder Naegele, indeed, says that, to positions of the third kind, those of the face come next in point of frequency, while the second is classed by him with the conjugate variety as rarest of all. The younger Naegele, again, who, while he enters into statistical details much more deeply, repeats and corroborates his father's doctrines, lays himself open in more than one place to criticism, in respect of the manner in which he disposes of his statistics to suit his own views. He states, for example, that his conclusions are based on 3795 cases of cranial position, but instead of placing these fairly under the four heads which constituted essentially the classification of the German school, he coolly says: "After deducting 94 cases, in which the original position of the head could not be made out on account of various circumstances, we have 3701 carefully observed cases of cranial presentation." Now, these 94 cases form nearly two and a half per cent. of the whole, and if divided, as we cannot doubt they ought to have been, between the positions numbered second and fourth, would have brought the statistics of Naegele very near to those of Dubois, whose observations accord perhaps as closely as those of any other with the prevailing ideas of the present day.

The statistics of Simpson and Barry confirm the conclusions of Naegele more closely than any others; but, it will be observed that, in both cases, a certain percentage of second and fourth presentations is admitted, which becomes more marked in the figures of Dubois.

The conclusions arrived at by the two observers whose names are placed last upon the list, indicate a startling discrepancy with the results given above, and are of themselves sufficient to show that the doctrines of Naegele are by no means definitely settled. Dr. Murphy's conclusions are the result of a careful personal observation, in the Dublin Lying-in Hospital, of sixty-eight cases of cranial presentation, in which he found the second position to occur as frequently as the third. His conclusions may at first seem to be less satisfactory than if they had been based upon a larger number of observations; but, at the same time, we must admit that the results obtained by so able and experienced an accoucheur as Dr. Murphy, should be held as more likely to be correct than when the observations on which statistics are founded are intrusted in a great measure to others. The experience of Dr. Swayne shows a larger number of cases of first position than any other observer, and in other respects his deductions are still more strikingly opposed to the idea generally received. Reverting to the opinion held before Naegele, he believes that in point of frequency the second comes after the first, and that the fourth is more frequent than the third, an opinion in which he is supported by Professor Millar of Louisville. In the table above given we have avoided extremes, or we could have given statistics which have been offered in proof of assertions which are, as regards the views of Naegele, more contradictory still.

In attempting to reconcile statements so conflicting as these, we cannot fail to become convinced of the fact that, even in the most experienced hands, it is no easy matter to determine the position of the head in the early stage of labor. It is not to be conceived that all the observers above quoted can be right. It is equally clear that nature must have some law, according to which the head of the child enters and passes through the pelvis of the mother. But is it in our power to determine what is this law of nature, and in what this or that observer has erred? Can we so reduce the law to statistical results, as to place the matter forever on the basis of irrefragable evidence? He would be a bold man who, in the present state of the art, would venture to answer these queries in the affirmative. For our part, we are convinced that there is ample room for renewed observation and research; but, unless a man can bring to bear upon the subject a mind unwarped by prejudice or preconceived ideas, his testimony will be of little avail. Take, by way of example of this, the second position. Who has not been summoned, again and again, to the bedside of a woman in labor, to find the head in the lower third of the pelvis, and in the position in question? In such a case, the disciple of Naegele would probably record in his note-book, "A case of third position, in which rotation had occurred before my arrival." He is driven to this conclusion if he adopts Naegele's theory, but yet, as regards the individual case, the evidence is Naegele's and not his. Or, again, if quite early in labor he finds the head undoubtedly in the second position, he classifies it as irregular, and assumes the presence of some of the "various circumstances" in which only, says Naegele, this position can occur. To be candid, however, we must admit of the possibility of a mistake which is the converse of this, and which would be committed by him who should rank every case as second, without any reference to the stage at which the first examination is made. It must, we think, be manifest that correct conclusions on this subject can only be based upon a large number of observations, in which the position of the head is ascertained, in every case, at the beginning of the labor, or before it experiences any pelvic resistance further than that which is due to gravity.

Granting that the first position is by far the most frequent, occurring, as it does, in about 70 per cent. of all cranial presentations; and, granting further, as we do, that Naegele's discovery—that the third is, as a primary position, next to the first in point of frequency—is correct, we are persuaded that both second and fourth cases occur more frequently than is generally supposed,—certainly much more frequently than Naegele would have us believe. We are inclined to think that, by striking an average between the percentage yielded by the statistics of Dubois and Murphy respectively, we should come very near the truth.

The proportion thus deduced stands as follows:

First Position.	Second Position.	Third Position.	Fourth Position.
67.03	9.52.	20 92.	2.52.

The second cranial position is, in all respects, both as regards pelvis and cranium, the exact converse of the first, and it is difficult to account for its comparative infrequency on any other ground than the presence of the rectum on the left side. It is somewhat strange that Naegele should reject this theory as improbable, as it is very obviously in favor of his argument that all cases, almost without exception, lie originally in the right oblique diameter; but perhaps we should, instead of being surprised at this, take it as evidence of his impartiality. Whether the rectum may, or may not, have an influence in determining the original position, it is clear that it bears practically on the progress of labor, especially if distended. But, even should it be empty, it is conceivable that the thickness of the coats of the bowel may tend to make a tight fit tighter.

The proportion of occipito-posterior positions which end with the face to the pubis is, for obvious reasons, very difficult to determine. It is not to be wondered at, perhaps, that great difference of opinion exists as to the proportion of cases which perform the usual rotation backwards; but it is a little astonishing that the actual number of cases ending with the face forwards should be overlooked or misunderstood. Naegele did not believe in the face-to-pubis termination of such cases, except under peculiar circumstances,—such as a small head or a large pelvis,—but there are probably few accoucheurs of large experience, who take the trouble to observe what passes under their eyes, but have met with such cases, there being no peculiar circumstances whatever to account for them. Drs. Simpson and Barry found—and their observations were subsequently confirmed by Dr. Bell—that, in the third position, spontaneous rotation occurred in 96 per cent.; while, still more recently, Dr. West found that in 481 cases observed by himself, 15 third cases were born, or were about to be born, with the forehead in advance; but these included, it must be remembered, cases in which he rectified artificially the position of the head, on the assumption that, had he not interfered, they would certainly have terminated with the face to the pubis. In regard to rotation in the fourth position, the number of cases observed is so small that no reliable data are to be found; but the impression generally prevails, that spontaneous rotation, in such cases, is effected with greater difficulty, and the tendency to fronto-anterior termination is thus proportionally increased.

Face Presentation.—The only other varieties of possible presentation of the cephalic extremity of the child which it is necessary here to consider are the various positions of the Face. These occur about once in 230 cases. The causes which lead to this unusual occurrence are not well understood, but the initiatory movement which results in the position can only be, as is obvious, a movement of extension, which, at an early stage of labor, or prior to its occurrence, is substituted for the usual movement of flexion occurring during labor in the ordinary positions of the cephalic extremity. In other words, and to take the most simple view of the matter, cranial are converted into facial positions by a simple movement of the head on its transverse axis. As, in this and other respects, there is a very close analogy between the mechanism of face and vertex presentations, we introduce the subject of the former at this place from a conviction that it will be much more easily understood if studied along with the ordinary cranial positions.

In pursuing the analogy which exists between the face and the vertex, we note, in the first place, that the "obstetrical" differs from the "anatomical" face in including the forehead. The long diameter of the face, therefore, which extends from the centre of the forehead between the frontal protuberances to the tip of the chin, corresponds to the occipito-frontal diameter; and, in like manner, the transverse diameter, from one malar bone to the other, corresponds to the biparietal measurement of the cranium. We observe, further, in looking closely at the facial oval, that the pointed chin represents the occiput, while the forehead is, in each position, the broad end of the long diameter. A premature and exaggerated movement of extension of the head having thus, as we conjecture, converted a cranial into a facial position, we find that in its descent and birth, it follows the same mechanical laws as those which govern the vertex. Movements are thus executed, which in every stage correspond to those already described, with this important distinction, that the relation which they bear to the trunk of the child is in some respects reversed. This will become apparent as we proceed. The face like the head, and for similar reasons, descends into the pelvis with its long diameter in one or other of the oblique diameters of the brim. There are thus four positions in which we may find the face, according as the presentation may have been originally a cranial position of the corresponding number. It will be observed, however, as a most important distinction, that the numbers of the Mento-Anterior variety do not correspond to the occipito-anterior of the cranium. Each presentation as numbered is, we repeat, supposed to be produced from the corresponding cranial position, by a simple movement on its transverse axis.

MENTO-POSTERIOR,	*First Position,*	Face in Right Oblique Diameter; forehead forwards.
	Second Position,	Face in Left Oblique Diameter; forehead forwards.
MENTO-ANTERIOR,	*Third Position,*	Face in Right Oblique Diameter; forehead backwards.
	Fourth Position,	Face in Left Oblique Diameter; forehead backwards.

The chin, in all these positions, being looked upon as the mechanical equivalent of the occiput, it follows that the Mento-Anterior position, in which the front of the child is turned forwards, is the natural termination of all face cases. This, indeed, is the case in a much stricter sense than in presentations of the cranium, for reasons which will appear presently. We shall, therefore, in the first instance, consider these two positions; and, as the fourth is the one which occurs most frequently, we shall commence with it.

Fourth Position of the Face.—Although it is not the usual course in these cases, we are entitled to assume it as possible that this position may be produced from the fourth of the cranium by a movement on its transverse axis, which brings the chin towards the right ilio-pectineal eminence, the head being extended so as to bend the occiput towards the nape of the neck. The long diameter, indicated by the direction of the nose, lies in the left oblique diameter, with the forehead towards the left sacro-iliac synchondrosis. The finger, on an examination, first reaches the right malar bone, which is the part deepest in the pelvis, and the presentation itself is made out by feeling the nose, mouth, and other features, care being taken not to injure these delicate parts by rough and careless manipulation. The long diameter descends obliquely, with the chin in advance, in proportion to the degree of resistance. The caput succedaneum will be found to involve the right malar bone, the right angle of the mouth, and the parts immediately adjoining. When the face reaches the floor of the pelvis, the chin is directed by the right ischial spine downwards and forwards, along the corresponding anterior ischial plane, while the forehead glides along the left sacro-sciatic ligaments towards the hollow of the sacrum, precisely as in the second cranial position. Having reached the perineum, and probably still retaining a certain degree of pelvic obliquity, the chin now moves forwards under the pubic arch. The perineum becomes distended, and the chin having moved sufficiently forwards to release the mental pole of the occipito-mental diameter, the emergence of the head takes place by a movement of flexion, the face being born forwards and upwards as the nose, forehead, vertex and occiput successively sweep over the perineum,—all of which takes place with no greater difficulty than in an ordinary cranial position. The shoulders having descended in the right oblique diameter, the right shoulder is lowest and in front. This part, therefore, is, in its turn rotated from left to right, along the anterior plane of the left ischium, while the left shoulder retreats into the hollow of the sacrum; and in this position they pass, as has already been fully described, under cranial positions, a corresponding movement of restitution being at the same time performed by the head. The trunk and breech follow as under ordinary circumstances.

Third Facial Position.—In this the mechanism is precisely similar to that which has just been detailed. The face, however, lies in the right oblique diameter, the forehead being to the right sacro-iliac synchondrosis, and the chin in the direction of the left ilio-pectineal eminence. The left side of the face is lowest in the pelvis, and it is on this that the caput succedaneum forms. The chin descends, and rotation takes place as in the former case, only in the contrary direction, the details of the process being in every respect similar.

First Facial Position.—In this, and in the remaining position, the prominence of the chin is turned backwards. Following the method which we have adopted with the view of maintaining as closely as possible the analogy subsisting between facial and cranial cases, we observe that the Mento-Posterior positions correspond closely with the fourth and third cranial. As in the mento-anterior variety, we may accept the chin as representing the occiput. The First Facial Position is produced from the first of the head, by a movement of extension. Its long diameter corresponds, therefore, to the right oblique diameter of the pelvis, the chin being directed to the right sacro-iliac synchondrosis, and the centre of the forehead towards the left ilio-pectineal eminence. The chin thus occupies the position where the occiput lies in a third cranial position. The part which is lowest in the pelvis, and which the finger feels from the vagina through the anterior walls of the uterus, is the right malar bone. If the os is sufficiently dilated, we may feel through it the bridge of the nose. Carrying the finger, in reference to the position which the woman occupies, downwards and forwards, we may reach the forehead, the frontal suture indicating the path from the bridge of the nose to the anterior fontanelle; while, by passing it in the opposite direction, upwards and backwards, we may feel the ridge of the nose, and the mouth, where the alveolar ridge may be distinguished, and ultimately reach the chin. Should the resistance of the os, at this stage, be such as to cause the development of a caput succedaneum, it will be found to occupy the upper half of the right side of the face, and will generally, to some extent, involve the eye.

With regard to this position, the same observations may be made as in regard to the third of the cranium,—that it *may* terminate in two ways: with the chin towards the hollow of the sacrum; or, by a rotation forwards, which, by bringing the chin upon the right anterior ischial plane, converts it into the fourth position, already fully described. Although Smellie, and many writers of merit since him, describe cases of facial presentation in which the chin passes into the hollow of the sacrum, and is born over the perineum, it is only with difficulty that we can admit,—for reasons which will be detailed afterwards—a bare possibility of such a termination of labor by the natural efforts. The head, therefore, adopts a course very similar to what obtains in third cases of the cranium. As in the one case the occiput, so in the other the chin descends, prior to rotation, somewhat in advance of the forehead. The fronto-mental diameter being, however, more than an inch less than the occipito-frontal, the same degree of obliquity is not necessary as an essential preliminary to rotation. And it is fortunate that it is so, for the head is already so strongly extended that a further extension seems all but impossible. In the course of the rotation, the chin comes out in front of the right ischial spine, while the forehead moves upwards and backwards towards the left sacro-iliac synchondrosis, and the case is thus converted into what we have already described as the fourth position of the face. The rotation, therefore, which converts the first facial into the fourth is, if we read "chin" for "occiput," essentially the same as occurs when the third of the vertex rotates into the second. Less obliquity of the long diameter of the face being required, the rotation of the face takes place with greater ease, which is another reason why we should look upon this as the only natural termination of that position of the face which is the result primarily of a movement of extension of a head occupying the first position of the vertex. The accompanying diagram (Fig. 114) shows the various stages alluded to.

FIG. 114.

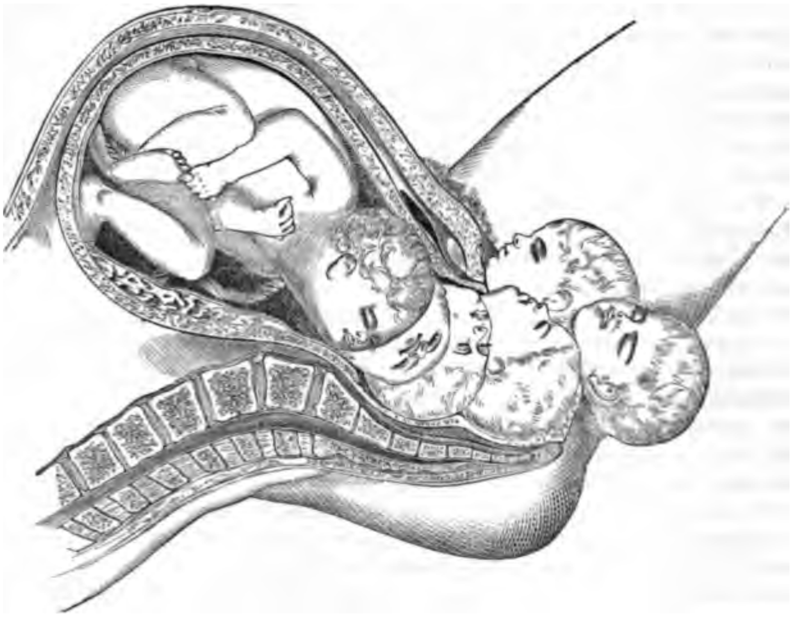


Diagram showing successive stages of rotation and delivery in the first facial position.

Second Facial Position.—In this, which is the converse of the first, the face is in the left oblique diameter, with the chin to the left sacro-iliac synchondrosis, and the forehead to the right ilio-pectineal eminence. The chin, therefore, lies in the position which the occiput occupies in the fourth cranial position, and the part which is the lowest in the pelvis is the left malar bone. The normal and almost invariable termination of such a case is a rotation analogous to what is observed in the fourth position of the vertex. The chin in this way becomes applied to the left anterior ischial plane, along which it glides as in what we have described as the third facial position, so as to bring it under the arch of the pubis, where the labor is terminated in the usual way.

The relative frequency in the occurrence of the various positions of the face might not unnaturally admit of considerable difference of opinion. For, if the ordinary positions of the cranium, which are so familiar to us, still admit of doubt in this respect, it is not to be wondered at, that doubt may still attach to this rare and, as some term it, faulty presentation. If we are correct in assuming, what is very generally admitted, that presentations of the face are the result, in the corresponding positions of the vertex, of a simple movement of the head on its transverse axis, the numbers which we have attached to the various facial positions have special significance in indicating the original position of the head. But there the numerical correspondence ceases.

For, the more closely we look at the relation which the one presentation bears to the other, the more obvious does it become that the chin is mechanically the analogue of the occiput, and that, therefore, the anterior surface of the fœtus is turned forwards in all face cases which are to be regarded as normal. In cranial positions, on the contrary, the back is, as a rule, turned forwards. This, while it so far destroys the analogy between the two classes of cases, establishes between them more important practical points of resemblance; for, as our object is, in any assistance which we may consider ourselves justified in offering, to bring the occiput forward under the pubic arch in cranial positions, so in these also we use what means we can, with the view of aiding in a similar way the descent and precedence of the chin. The aphorism of Roederer might, in fact, if we substitute the word "mentum" for "occiput" be admitted as the leading principle upon which nature conducts all such labors. "Indifferens est quisnam sit capitis positio, modo pars conica atque arctissima, *mentum* nempe, descendat."

In point of relative frequency, therefore, we must speak with some caution. No doubt can exist with reference to the fact that the third and fourth, or mento-anterior, positions are the natural terminations of all face cases. In what proportion of these, third and fourth positions of the cranium have become directly transformed, as we have conjectured, into the corresponding facial positions, it is, and probably from the rarity of the cases always will be impossible to determine. That such a transformation is possible, no one can deny; that it is probable, we will venture to assert. And, moreover, should it so occur, the change of a fronto-anterior position of the cranium into a mento-anterior of the face must be looked upon as a much more favorable termination of a labor, than the tedious process already described which, in a certain proportion of such cases, brings the occiput over the fourchette before the face can pass from under the pubis. It is on this ground, indeed, that we have considered ourselves justified in taking note of these as distinct positions, and not merely as stages in the course of the other two.

If we take into consideration, however, the enormous preponderance of cases in which the cranium or vertex presents with the forehead backwards, we readily admit that it is much more than probable that the mento-posterior positions are, in the earlier stages of labor, the usual positions of the face. The fact again that the first position of the cranium occurs in nearly 70 per cent. of the four varieties of these cases, suffices to account, on the principle of rotation, for the preponderance at the moment of delivery of fourth over third facial positions. But the fact recorded by Naegele, that the preponderance alluded to amounts only to twenty-two fourth, as against seventeen third, facial positions, can only be accepted as confirmatory of his statements as to the frequency of the various vertex presentations, by supposing that the third position of the cranium is, as we have assumed, not unfrequently converted by simple extension into the corresponding position of the face. Otherwise, the disproportion would be much greater between the two mento-anterior terminations than he assumes.

That mento-posterior positions may terminate as such in a large pelvis, or in cases of premature delivery, we may admit as possible. But, if we consider carefully what this termination implies, in the case of an ordinary pelvis and a fully developed head, we find it impossible to conceive a degree of extension which would involve such compression and moulding of the head, as would bring the occiput into relation with the dorsal vertebræ before the chin could reach the posterior commissure of the vagina. We believe, therefore, that the cases upon which the assertions of Smellie and others are founded must have been of the exceptional nature above referred to. And, if such cases do occur, the mechanism at the moment of birth of the head must be the arrest of the chin at the fourchette, and a movement of flexion which, while relieving the head from its constrained position, brings the mouth, nose, forehead, and vertex successively in a backward direction from beneath the pubic arch.

All presentations of the face were at one time supposed to be abnormal and dangerous. This belief gave rise to different methods of operative interference, which were devised with the view of rectifying the position. Of these, the operation of turning found special favor in the eyes of the older accoucheurs, who did not scruple, as a matter of routine, to introduce the hand, and turn, in all cases in which the position was recognized at a period sufficiently early in the labor. Till the beginning of the present century, indeed, this was the mode of procedure which received the sanction of the most eminent authorities. The attention which about this time was directed to the subject of scientific obstetrics soon showed how erroneous was this view, and how greatly increased was the risk both to the mother and child by the operation of turning. But the idea of necessary interference of some kind had got too firm a hold of the professional mind to be at once dispelled, and we therefore find substitutes for the discarded operation, sanctioned by the authority of some great names. We find, for example, that it was recommended by Dr. J. Clark, to allow the face to descend into the cavity of the pelvis, and then, by steady pressure exercised upon the presenting malar bone during a pain, to push the face into the hollow of the sacrum, and allow the occiput to descend. That Dr. Clark may have succeeded, as he says, in such cases, we must not doubt; but we confess to great skepticism as to the feasibility of such a proceeding under ordinary circumstances, and we have little doubt that, if we did succeed, the risk to the child would be rather increased than lessened.

Until it had been demonstrated by Naegele, accoucheurs were quite ignorant of the rotation which occurs in the great majority of face cases, whereby, in mento-posterior cases, the chin spontaneously comes forward under the pubis. It was therefore a totally erroneous impression of the nature of these labors which led Baudelocque to suggest, and so many of his followers to adopt an operation which is scarcely less objectionable than turning. In recommending the operation referred to, he directs us to pass the finger through the os, and along the anterior wall of the uterus over the forehead, and then, rupturing the membranes, attempt to drag down the occiput. This he naturally conceives to be better than to leave the case to nature, believing as he did that all mento-posterior cases could only terminate as such. This and all other similar modes of procedure were at once thrown aside when the fundamental errors from which they sprang were removed by the industry and genius of Naegele.

In face presentations, as they occur in actual practice, we believe the safest rule for our guidance is to avoid interference as far as possible. In occipito-posterior positions of the cranium, we have recommended interference in such cases only as threaten to terminate with the forehead in advance, and the same rule should guide us in our management of the face. When the chin is originally forwards, or has already rotated, no interference whatever is required. It is usually recommended, however, in the mento-posterior positions, to aid the rotation, either by hooking the finger into the mouth, and making cautious traction in the proper direction, or by some other mode of manual interference, with the view of bringing the chin towards the pubic arch, as the face is about to emerge from the pelvis. It is doubtful, however, whether such interference should be sanctioned as the proper routine procedure. So many delicate points have here to be attended to—the direction of the pressure, the time for operation, and the like—that we incline to the belief that nature should, in the great majority of instances, be trusted to. For, if the practitioner of average experience can have but a few cases to observe in the course of a lifetime, it is scarcely to be expected that he can attain such special skill as to act with unfailing precision. We should, therefore, in any such case as may come under our notice, carefully watch the process which nature is adopting, and act only in such instances as she may seem to be calling for assistance.

It may be necessary, in facial as well as in cranial positions, to give assistance by manual or operative interference in cases in which delivery is delayed, although the parts are normally situated. Such aid as, under the circumstances, it may seem necessary to afford, is to be employed in each case on the same principles. The only points which are here to be remembered as distinctive, arise from the facts—that in facial positions the vessels of the neck are, in consequence of the peculiar position, subjected to very unusual pressure, and that the adjacent maternal organs are also likely to be compressed by the manner in which the child's head is doubled back. Both of these conditions should lead us, therefore, to watch the progress of such a case somewhat more strictly than usual, in order, if possible, to detect the earliest indications of abnormal obstruction to delivery, and so soon as this may arise, to relieve it without delay. The forceps, for example, may be employed in such cases, at a period somewhat earlier than is considered necessary in cranial positions, in proportion exactly to the imminence of the danger which we apprehend. Should it, however, occur that the head descends to the floor of the pelvis, and yet no effort is made in the way of rotation, it will be proper to aid the movement in question, having first carefully ascertained the position of the face, and calculated the direction in which our efforts should be applied. Persistent mento-posterior cases may possibly, as has already been said, terminate as such, if the child be premature or putrid, or the pelvis of unusual capacity; but if, owing to the disproportion of parts, or some other special cause, rotation should not be effected, the inevitable result is such obstruction as may be called insurmountable; and in these instances the forceps, the crotchet, or the perforator may be required before the relief of the woman is effected.

Although but four positions are above described, it may be said of face, as of cranial positions, that there is no possible diameter of the brim which may not be occupied, in some case or other, by the long diameter of the face. And, in regard to the position of the parts after they have descended in the cavity of the pelvis, it may be further noted, that certain intermediate or modified presentations may possibly occur. Brow presentations, for example, are described by many writers, and, in so far as we may judge from comparative measurement and mechanism, are to be admitted as possible. They must, however, be always looked upon as of the most unfavorable nature, and one of the most formidable objections to Baudelocque's operation was the risk of thus converting an unfavorable position into one which was, perhaps, even more so, should the attempt at artificial rectification be arrested midway in its course. A thorough knowledge of the mechanism of ordinary labor will be the best guide to the management of any such exceptional cases as may offer themselves in the course of practice.

We have attempted throughout, in the description which has been given of the four positions of the face, to indicate the strong analogy which exists between them and the ordinary positions of the cranium, which are so familiar to all. The prominence of the chin, therefore—be it once more remarked—is the analogue of the occiput. This is more clearly shown in the following tabular statement, which is drawn up with the view, not only of showing the relation between facial and cranial positions, but also of enabling the student to store the facts in his memory, in such a form as may be most available for practical emergencies in any position of the cephalic extremity of the child.

Tabular Arrangement of the Presentations of the Cephalic Extremity of the Fœtus.

Cranium or Vertex.		Face.	
Occipito-Anterior.	I. In Right Oblique Diameter; forehead to right sacro-iliac synchondrosis.	Mento-Posterior.	I. In Right Oblique Diameter; forehead towards left ilio-pectineal eminence. *Rotates into the 4th.*
	II. In Left Oblique Diameter; forehead to left sacro-iliac synchondrosis.		II. In Left Oblique Diameter; forehead towards right ilio-pectineal eminence. *Rotates into the 3d*
Occipito-Posterior.	III. In Right Oblique Diameter; forehead towards left ilio-pectineal eminence. *Usually rotates into the 2d.*	Mento-Anterior.	III. In Right Oblique Diameter; forehead to right sacro-iliac synchondrosis.
	IV. In Left Oblique Diameter; forehead towards right ilio-pectineal eminence. *Usually rotates into the 1st.*		IV. In Left Oblique Diameter; forehead to left sacro-iliac synchondrosis.

In Cranial Positions, therefore, *the third rotates into the second, and the fourth into the first;* while in Facial, *the second rotates into the third, and the first into the fourth.*

CHAPTER XIX.

PELVIC PRESENTATIONS.

THE PRACTICE OF THE PAST—THE PELVIS A NATURAL PRESENTATION—DORSO-ANTERIOR AND DORSO-POSTERIOR POSITIONS—BREECH PRESENTATION ; FOUR POSITIONS OF—FIRST POSITION OF THE BREECH : ROTATION : PASSAGE OF THE BUTTOCKS : DESCENT AND BIRTH OF THE SHOULDERS : DIFFICULT PROGRESS OF THE HEAD, AND MECHANISM OF ITS EXPULSION—SECOND POSITION OF THE BREECH—THIRD POSITION OF THE BREECH: BIRTH OF THE LOWER PORTION OF THE TRUNK, AND OF THE SHOULDERS : ROTATION OF THE FACE BACKWARDS, AND MECHANISM OF THE BIRTH OF THE HEAD: EXCEPTIONAL TERMINATIONS—FOURTH POSITION OF THE BREECH—SPECIAL RISK OF PELVIC PRESENTATIONS—DIAGNOSIS AND PECULIARITIES—KNEE AND FOOTLING CASES—MANAGEMENT OF PELVIC PRESENTATIONS—NATURE OF ASSISTANCE TO BE RENDERED—USE OF THE FILLET, VECTIS, AND BLUNT HOOK—INDISCRIMINATE DRAGGING ON THE LOWER LIMBS TO BE AVOIDED—TREATMENT OF CASE WHERE ARMS PASS UP ALONGSIDE HEAD—MANAGEMENT OF THE FUNIS—INDICATIONS OF IMPENDING DEATH OF THE CHILD—MANIPULATION FOR EFFECTING SPEEDY DELIVERY OF THE HEAD—USE OF THE FORCEPS.

ALTHOUGH the writer of the obstetrical memoranda which were attributed to Hippocrates recognized the oval position of the child in the womb, and illustrated the impossibility of delivery in cross birth by the graphic simile of the olive in the neck of an oil jar, he, strangely enough, as has already been mentioned, omitted to perceive the full force of his illustration. For, as every oval has two ends, he ought to have concluded that the fœtal oval could pass naturally with either of these in advance, as the olive might be extracted from the jar. Failing to observe this, however, the ancients believed that presentations of the pelvic extremity were abnormal, and should in all cases be rectified by artificial aid. The result of such a mode of practice as this points to —which obtained throughout a period of several centuries—is looked at by the modern obstetrician with horror, on account of the fearful sacrifice of human life which such a procedure must have involved. There is nothing, indeed, in the history of Midwifery comparable to this; and the idea of turning by the head in all cases of pelvic presentation is one so repugnant to every principle of the science and art of obstetrics, that it is difficult to conceive by what perversion of reason a blunder so fearful could have been perpetrated. Certain it is that, until the revival of anatomy by Vesalius, and even for some time after the art of printing had been discovered, the practice recommended in pelvic presentations was that which has just been indicated as dating from the time of the ancients.

It is to Ambroise Paré that we owe the correction of this monstrous error, and from his day these presentations have been recognized as natural; and, although much more dangerous to the child, they are attended with no increase of risk to the mother. While, however, we prefer to consider presentations of the Pelvic Extremity as natural, it must be noted that many writers have thought it necessary to classify them as preternatural, an opinion which has given rise to much controversy, an analysis of which would serve no good or useful purpose. The pelvic end of the fœtus is made up of certain anatomical elements which may present themselves in various positions. The ordinary position is that in which the fœtus preserves its usual intra-uterine attitude, with the limbs flexed, but with its axis inverted, so that the presenting part is the Breech. If, however, the inferior extremities become separated from the trunk, and thus occupy the inferior segment of the uterus, we may have other presentations which fall under the same category, such as presentation of the knees or of the feet, or of one knee or one foot. The classification, therefore, of possible positions may be multiplied by a little ingenuity, to such an extent as to render the subject an extremely complicated one, and its study a very wearisome task. Here again, we owe much to the indefatigable industry of Naegele. For it was he who first showed that although we may subdivide the positions *ad infinitum*, all pelvic presentations may, in so far as the mechanical phenomena of labor are concerned, be reduced to two classes according as the dorsal or abdominal surface of the child is turned forwards within the womb. We shall now proceed, therefore, to the description of the positions of the breech, which will suffice for all possible presentations of the pelvic extremity. Certain peculiarities attach to cases of knee and footling birth, which, being of a practical nature, will receive a brief notice in the proper place.

The structures which form the breech of the child are of a much softer and more yielding nature than the cranium, and are, therefore, within certain limits, more plastic and susceptible of adaptation to the parts through which they have to pass. Parturition is not the less on that account governed by fixed mechanical laws, according to which the parts enter, pass through, and emerge from the pelvic and parturient canal. To the consideration of these we now pass. In presentation of the breech we find no less marked a preference for the oblique diameter than in the case of the cranium, so that the child, when normally presenting, lies with its back or belly forwards, and turned at the same time either to the right or to the left. The two main divisions of all such cases then are, according to Naegele and all subsequent observers, Dorso-Anterior and Dorso-Posterior positions, the former being more frequent in the proportion of three to one. As each of these implies a possible position of the transverse or long diameter of the pelvis in either oblique diameter, we may here, as in cranial and facial cases, detail four Positions of the Breech as follows:

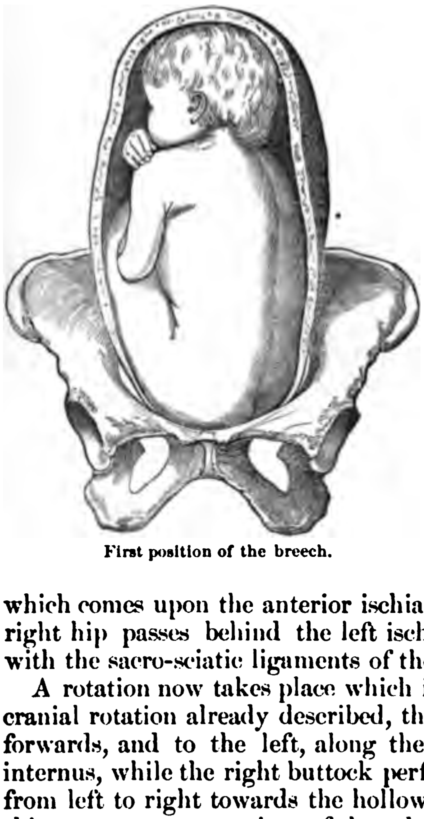
Dorso-Anterior,	*First Position,*	Breech in Left Oblique Diameter; left trochanter forwards.
	Second Position,	Breech in Right Oblique Diameter; right trochanter forwards
Dorso-Posterior,	*Third Position,*	Breech in Left Oblique Diameter; right trochanter forwards.
	Fourth Position,	Breech in Right Oblique Diameter; left trochanter forwards.

The breech is recognized, on a digital examination, by the ischial tuberosities, between which the genital organs, male or female, may be distinguished. As the parts are, however, frequently much distorted by the formation of the caput succedaneum, it is not always so easy for the beginner to recognize the position as he may perhaps imagine. He may, in a hurried and imperfect examination, very readily mistake the tuber ischii, which his finger first touches, for the prominence of the shoulder, and the female genital organs for the fold of the axilla. It is well, therefore, that in every case he should make a leisurely examination, in order to insure the accuracy of his diagnosis. The genitals, occupying a situation between two osseous prominences, one of which is usually considerably lower than the other, can scarcely be taken for anything but the breech; and, in the case of the male, the scrotum is generally tumefied. But, if any doubt should arise, this is set at rest if, in addition to the parts named, he recognize the anus, the point of the coccyx, and the unequal osseous surface of the back of the sacrum. To this last point Cazeaux attaches considerable importance. At the commencement of labor, or even before it has come on, it may be possible to recognize these positions by palpation of the abdominal tumor, which, when the walls of the belly are thin and relaxed, enables us to recognize the general outline of the child, with the rounded resistant cephalic extremity turned towards the fundus and inclined a little to either side. The pulsations of the fœtal heart are heard on a somewhat higher level, near the umbilicus. The absence in the vagina of the firm and smooth globular head, which generally occupies the lower segment of the uterus, would further corroborate such observations as the above. The presentation is, at this stage, higher than usual, and often beyond the reach of the finger; but, in knee and footling cases, the knees or heel may be felt lying against the most dependent part, and retreating before the pressure of the finger. In its general shape and external appearance, the uterus is not sensibly altered.

Presentation of the pelvic extremity is by no means a rare occurrence, as it is met with once in about 45 mature births; and, in premature delivery, it is, for reasons formerly stated, much more frequent. In 80 cases observed by Dubois, 54 were ordinary breech positions, and in 26 the feet descended in advance. Madame Lachapelle only saw the knees presenting once in 3445 instances of labor, and in the statistics of the Lying-in Hospitals of Würzburg and Prague, we find but one case in 9274. The breech is, however, not only the most frequent but the most favorable of the pelvic presentations. For, although at first sight it might appear that a footling or knee position might, on the principle of the wedge, be a more favorable arrangement mechanically, an observation of the whole process at once shows that this is not the case. The broad breech, increased in bulk by the flexion of the thighs, performs a most important function in dilating the passages for the safe and rapid progress of the head, during the latter and more critical period of the labor; and, as it is very evident that this will be more effectively done by the breech than by the footling presentation, the former is, from a mechanical point of view, undoubtedly the most favorable.

First Position of the Breech.—Of all the possible positions of the pelvic extremity this is the most common. In it, the transverse or long diameter of the breech occupies the left oblique diameter of the brim, so that, as the back of the fœtus is turned forwards, it is the left ischial tuberosity which is lowest in the pelvis and upon which the finger impinges on examination. The position is shown in the accompanying engraving. Backwards, and in the direction of the left sacro-iliac synchondrosis, another similar projection is reached, and between the two, in a direction corresponding to the right oblique diameter, is a sulcus or depression, in which may be recognized, from before backwards, the coccyx, the anus, and the external genital organs. In proportion to the resistance offered to the breech in its descent, there is an increase in its obliquity, which brings the left buttock still more in advance, precisely as occurs in the descent of the occiput. When the breech reaches the floor of the pelvis, therefore, it is the left hip and posterior surface of the left thigh which comes upon the anterior ischial plane of the right side, while the right hip passes behind the left ischial spine and comes into contact with the sacro-sciatic ligaments of the same side.

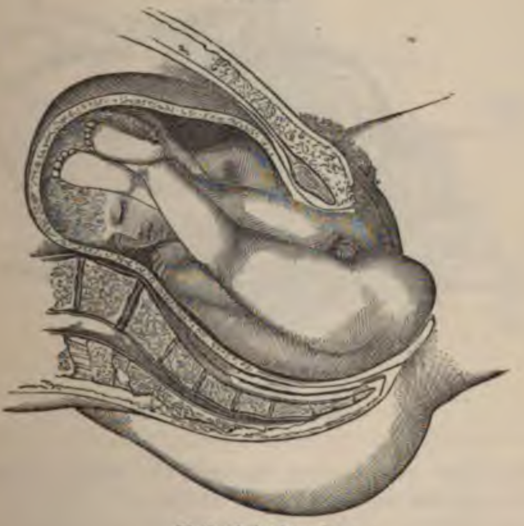
Fig. 115.



First position of the breech.

A rotation now takes place which is in every respect analogous to the cranial rotation already described, the left buttock gliding downwards, forwards, and to the left, along the ischial plane and the obturator internus, while the right buttock performs the corresponding movement from left to right towards the hollow of the sacrum. There is not in this case—as a comparison of the relative measurements will show—the same imperative necessity for rotation which obtains in the case of the head. But in its birth it follows the same mechanical law, with this difference only—that the rotation is, in the case of the breech, more rarely complete into the antero-posterior diameter than occurs when the head is the presenting part. It might be supposed, following the analogy of the mechanism of the occipito-anterior positions of the vertex, that the left buttock passed upwards and forwards under the pubic arch, while the right swept over the perineum. Such, however, is not the usual mechanism of the process. The left buttock, indeed, moves forwards to the arch, but at this point it is arrested and forms a centre, upon which the right buttock describes the arc of a circle, from before backwards on the distended perineum, so that, in the act of birth, it takes precedence of the left, which passes immediately afterwards. The long diameter still preserves to the last a certain amount of its obliquity, so that the right buttock is directed a little to the left of the middle line, and so soon as it has passed, the feet and knees slip down, and with the movement of extension of the thighs the lower part of the trunk is born. The belly of the child thus lies towards the right thigh of the mother. No marked movement of restitution occurs at this stage, because the shoulders are descending in the same oblique diameter as was occupied by the breech. If, however, the trunk of the child does not participate in the rotation of its pelvis, a certain degree of restitution may occur to relieve the twisting of the vertebral column.

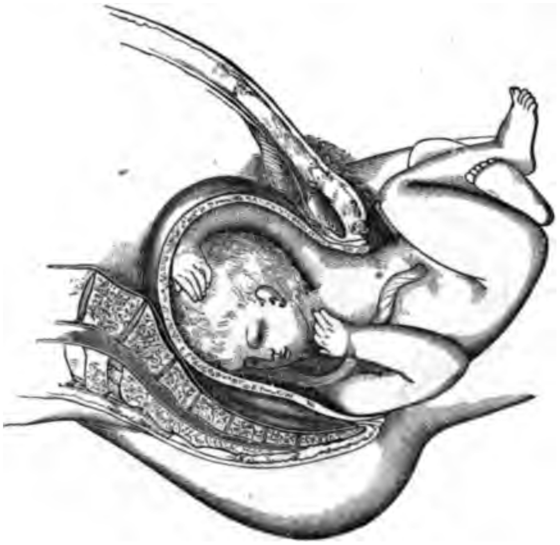
FIG. 116.



Birth of the breech.

The thorax now occupies the pelvic cavity. The superior extremities, if normally situated, are in contact with the anterior and lateral parts of this region of the trunk. The long diameter of the shoulders, occupying like the breech the left oblique diameter, descends under the influence of successive pains. When the resistance of the pelvic floor is fully encountered, a movement is executed in every respect similar to that which is observed in the passage of the breech. The left shoulder comes forward towards the summit of the pubic arch, but is there arrested, so that the right sweeps over the perineum, and is born in advance of its fellow, as shown in Fig. 117. It happens, not unfrequently, that the hands and arms slip up during the descent of the trunk, and become applied to the sides of the child's head, a position which, in a pelvis below the average in its measurement, gives rise to considerable obstruction and delay. The original position of the head with reference to the trunk, in all breech cases, is with the chin flexed towards the sternum, which permits of the expulsive force being communicated to the trunk to the greatest mechanical advantage. Any movement of extension which may occur tends not only to disturb the conditions upon which a speedy labor depends, but may also, by allowing the hands to slip between the chin and the sternum, and thence to the side of the head, interpose a very serious barrier to the accomplishment of the labor, more especially if, as sometimes happens, one becomes locked behind the head, and between it and the pubis.

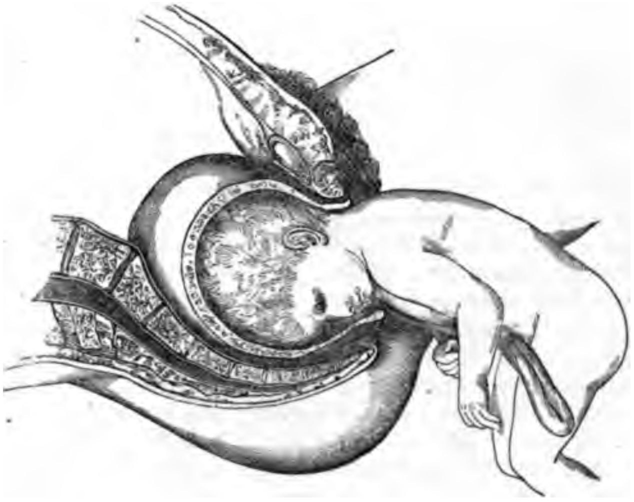
FIG. 117.



Birth of the shoulders.

As the shoulders are passing through the outlet of the pelvis, the head descends in the right oblique diameter. The point of essential distinction between pelvic and cephalic presentations becomes manifest at this stage. In the latter, the difficulty terminates with the birth of the head and the passage of the shoulders, but in the former it is widely different. No inconsiderable difficulty here attends the passage of the breech: the shoulders are in many instances only expelled by powerful uterine effort. But, instead of the difficulty ceasing with the birth of these parts, it becomes increased, and the really anxious and critical time of the labor now begins. For not only has the most unyielding part of the fœtal oval still to pass, but it has to pass under circumstances which necessarily imperil the life of the child. Beyond a certain point, indeed, delay involves death to the child, so that the skilful management of this stage may be said to be one of the most important practical duties of the accoucheur. A cause which, at this moment, increases the risk, is the failure of expulsive force. This does not imply so much a failure of expulsive action as that, the uterus being now nearly empty, its propulsive energy is brought to bear upon the head at great mechanical disadvantage; and it is difficult to see how, but for the contraction of the vagina, and of the muscles at the floor of the pelvis, nature could ever complete a case of pelvic labor. In the position which we have at present under consideration, the head descends with the forehead turned towards the right sacro-iliac synchondrosis, and a little in advance. The occiput is turned towards the left ilio-pectineal eminence, and after rotating towards the subpubic arch, is there arrested until the chin, face, forehead, and vertex sweep successively forwards and upwards over the distended perineum. Fig. 118 shows the head in this position immediately prior to the final act which terminates the second stage of labor.

FIG. 118.



Birth of the head.

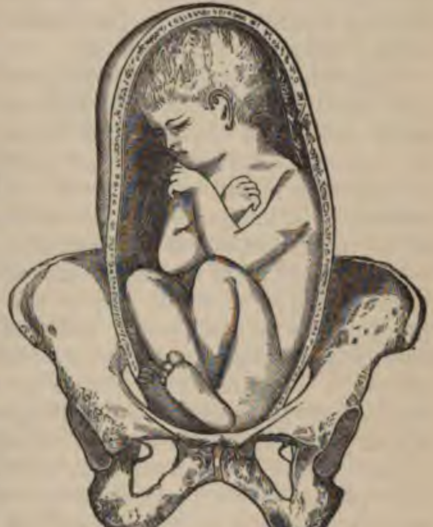
Second Position of the Breech.—In this, the position is also dorso-anterior; but, instead of occupying the left, as in the position above described, the pelvis descends in the right oblique diameter. It is therefore the right ischial tuberosity which presents, and the right buttock which descends in advance as far as the pubic arch, being directed towards it by the anterior inclined plane on the left side of the pelvis. The left hip sweeps over the perineum, and the shoulders descending in the right, and the head in the left oblique diameters, are successively expelled by a mechanism which is in all respects identical with that which obtains in the first position, only in the contrary direction as regards the various rotatory and other movements. At first it seems strange that this should be less frequent than the first position, and that nature should prefer the left oblique diameter in breech cases to the right; and this too would almost seem to throw doubt upon the opinion we have expressed that she prefers the right oblique in cranial presentations, in order to avoid the left, which is encroached upon by the rectum. But, even here, if we watch the case to a termination, we find nature apparently guided in a majority of cases by the selfsame law. For, as we have already seen, the really critical and important moment of a breech case is that during which the head passes through and out of the pelvis; and it is on this account that in the more common first position the head is in the favorable diameter; whereas, in the second, the head descends in the left, which is thus, as statistics would seem to show, more dangerous to the child, as the detention of the head is more likely to occur.

Third Position of the Breech.—Of 161 cases occurring at Heidelberg, 121 presented with the back, and 40 with the belly of the child turned forwards. This gives, as nearly as possible, a preponderance in favor of the two first positions, already set down at three to one. The two Dorso-Posterior positions, then, are of comparatively rare occurrence.

In the Third Position, which occurs less frequently than any of the others, the breech lies in the left oblique diameter, which, as the back is turned towards the vertebral column of the mother, brings the right tuber ischii to the front, and deeper in the pelvic cavity. When it reaches the floor of the pelvis, the corresponding buttock glides along the right ischial plane, and attains the summit of the pubic arch, where it is arrested until the left ischium sweeps over the perineum, when the belly of the child is born towards the mother's left thigh. The shoulders descend in the same oblique diameter, and are expelled pretty much as in the dorso-anterior position. The head then enters the pelvis in the right oblique diameter, with the occiput towards the right sacro-iliac synchondrosis. In the great majority of cases, the termination of this position is by a rotation which brings the occiput from the sacro-iliac synchondrosis to the obturator foramen on the right side, and the forehead from the obturator foramen to the sacro-iliac synchondrosis on the left side. In a word, the rotation is the same which converts a third into a second position of the cranium. This rotatory movement has, in some cases, been observed to take place at an earlier period in the labor. When that occurs, the movement takes its direction from the original rotation, which brings the right buttock in advance. It passes then, from right to left, into the conjugate, and a little beyond it, and ultimately continues the movement in the same spiral direction, until the belly of the child looks almost directly backwards. The trunk, in this case, participates in the rotation of the breech; but if it does not so participate, the head itself, when subjected to the resistance of the pelvis, performs the extensive rotation which we have described. Whatever may be the course of labor in this position, the natural termination is a rotation into the second position. The head, therefore, whether the vertex or the breech presents, rotates, as a rule, *from the third position into the second.*

Cases are occasionally observed in which the rotation above described does not take place, and the head comes into the world with the occiput turned backwards. The usual course in such a case is, that the head descends in the pelvis in a strong state of flexion, with the forehead and occiput turned to the anterior and posterior extremities, respectively, of the right oblique diameter. The usual movement of rotation brings the occiput along the right sacro-sciatic ligaments towards the hollow of the sacrum, and the forehead from left to right, under the subpubic arch. The original movement of flexion is then continued, so as to bring the face, forehead, and vertex, in succession, from behind the symphysis, while the occiput, around which, as a centre, this movement has been executed, is the last part to escape. It would also appear, from cases which are recorded upon good authority, that the head in this position may escape by a movement which is not one of flexion, but of extension. The occiput, in those rare instances, would seem to have preceded the forehead in its descent; the chin rests upon the lower part of the symphysis, and the occiput, vertex, forehead, and face successively emerge over the perineum, the depression between the chin and the trachea being the centre upon which the movement of extension occurs.

FIG. 119.



Fourth position of the breech.

Fourth Position of the Breech.—Of the two dorso-posterior positions of the breech, it is this which is more frequently met with. The long diameter of the hips occupies the right oblique diameter of the brim, so that, while the child sits, as it were, upon the brim of the pelvis, its anterior surface looks forward, and to the right. The left trochanter is towards the left ilio-pectineal eminence, and it is consequently the left tuber ischii which is forwards, and stands lowest in the pelvis. The breech and shoulders descend as in the third position, each performing the same limited amount of rotation and external restitution, the head then arrives in the pelvis, in the left oblique diameter, the chin being in front of the right, and the occiput behind the left ischial spine. The head then rotates, under ordinary circumstances, *from the fourth position into the first*, the occiput travelling, as in the corresponding positions of the vertex, from the left sacro-iliac synchondrosis, onwards along the left side of the pelvis, until it arrives at the subpubic angle, where it is arrested, and the face, forehead, and vertex sweep, as in the preceding presentation, forwards over the distended perineum. The same exceptional cases may also occur as in the third position, and we should therefore be prepared for the possible occurrence either of complete rotation before the head descends to the brim, or of one or other of the occipito-posterior positions which have been described.

All presentations of the breech tend, therefore, as has been shown, to terminate more irregularly than those of the head. The birth of the nates is attended with even less difficulty than when the head precedes, but the real difficulty of the case is the speedy and safe passage of the latter. And it is indeed remarkable, not only in regard to the first position, but also the fourth or more frequent of the dorso-posterior positions, that the head, in its descent by the normal path, avoids that oblique diameter which is contracted by the rectum. But whether this occurs or not, all pelvic presentations are attended by special and greatly increased risk. This is much more so, however, in regard to knee and footling cases, than when the breech presents in the ordinary way. This is brought out very clearly by the statistics of 71,578 cases collected by Dr. Rigby from various sources. The nates presented once in every 78 cases, and the feet once in 108.5: of the nates cases the child was born dead in the proportion of 1 to 3.8, and in the footling births 1 to 2.8. Knee presentations are so rare that they need not be taken into consideration.

Something must here be said in reference to the diagnosis of knee and footling cases, but as regards the mechanism, according to which labor under such circumstances is accomplished, no special description is necessary, as it differs in no material respect from what has been described in regard to the breech. The mechanism of all pelvic presentations is, in other words, essentially the same. Very little in these, as in pelvic presentations generally, can be recognized with certainty, until the rupture of the membranes enables us to distinguish the various parts. The form of the bag of waters, upon which some have laid great weight in a diagnostic point of view, may certainly give rise to suspicion, although it can never by itself be of much importance. In all pelvic presentations it is, as a rule, more pointed, and projects further into the vagina. In footling cases, the bag is long and sausage-shaped, and through it the foot or feet may be felt. When the membranes ultimately give way, the discharge of the liquor amnii does not take place with such a gush as in cranial positions, but on the other hand it is more continuous, and the drainage more complete. The head, acting like a ball-valve, hinders the liquor amnii from escaping, except in small quantities, in the intervals between the pains; but the irregular pelvic extremity admits of a more complete escape, which, by bringing the uterus to bear more powerfully and directly upon the surface of the child, no doubt increases the risk in all such cases. The foot is very liable to be mistaken by beginners for the hand, for, although any one could distinguish between the two with the eyes shut, if he could bring the whole of his ten fingers to bear upon it, it is a very different matter when he attempts to recognize a part which can only be reached by a couple of fingers, and that possibly with difficulty. The length of the digits, and the mobility of the thumb as compared with the great toe, will prevent the possibility of doubt when we can recognize these points, but under circumstances of unusual difficulty this may be impracticable. No single anatomical feature of the foot is, in difficult cases, so characteristic as the prominence of the heel. The dorsal surface of the hand may be mistaken for the instep and the fingers for the toes, but on the other side of the joint there is nothing in the hand which can be compared to the projection of the heel. If, therefore, we can pass one finger over the dorsum of the foot, and another over the heel, which enables us to grasp the extremities of the limb like the head of a crutch, we may be perfectly confident that it is a foot and not a hand with which we have to deal. And we would here observe, parenthetically, that this is one of many points, in regard to which the young practitioner should lose no opportunity of perfecting the *tactus eruditus;* for a mistake here, which is acted upon by operative or other interference, may bring discredit upon him, and, what is worse, may directly lead to the most disastrous results. The determination of the position from a single foot is a matter in reference to which some doubt may exist. The general direction of the toes will, however, indicate the abdominal surface of the child, and if both feet should present, this is much more certain. We may, however, have to wait for the descent of the breech before we can be certain to which of the four positions it is to be referred. A single foot should always, if possible, be identified as right or left, which is very easily done, if it be sufficiently within reach, by placing the palm of the hand to the sole of the foot in the same manner as is pursued in identifying a single hand, as will be more particularly described afterwards.

The risk to the mother in presentations of the pelvic extremity is in no way increased; for, admitting that the opinion generally expressed in regard to the tardy completion of the first stage is correct, we may assume that this is fully compensated for by the comparative ease with which the child makes its way through the passage. But the figures already quoted, which are confirmed by the experience of every one, show only too clearly that the risks to which the child is exposed are enormously increased. It is equally certain,—as, indeed, is further indicated by the figures alluded to,—that the risk is not the same in all cases of pelvic presentation alike, but is greatly increased in those cases in which the thighs are extended, and not flexed upon the trunk. The cause of this is to be found, as has already been incidentally remarked, in the inefficient manner in which the canal is thus dilated for the passage of the head, which delays the completion of the labor at the critical moment when, all being born but the head, it is arrested in the pelvis until the life of the infant is destroyed by suffocation. In an ordinary breech labor, the more complete dilatation of the parts reduces this risk to a considerable extent, but even under the most favorable circumstances the risk is, as compared with cranial births, enormously increased. And it is none the less certain that, by prompt and skilful measures, the accoucheur will often have the gratification of saving lives which, if left to nature, would have inevitably been sacrificed. A thorough knowledge of the mechanical phenomena above detailed, is the first essential qualification which may lead to skill and judicious management in the treatment of all cases of pelvic presentation. In order thoroughly to understand the subject, however, we must view it under various aspects. While we have no difficulty, for example, in recognizing that, in many instances, assistance is necessary, we must not overlook the fact that injudicious interference is bad. We have to consider, therefore, not only what to do, but what *not* to do; for unfortunately many errors in practice have been committed, and as some have had the sanction of great names, it is doubtful whether on this subject sound practical views are entertained as invariably as they ought to be.

Long after the preposterous idea of Hippocrates, alluded to in the beginning of this chapter, was exploded, views erroneous, but erroneous in a minor degree, obtained in reference to the treatment of presentations of the pelvic extremity of the child. We thus find Williams, Hunter, and Smellie bringing down the feet when the breech presents at the beginning of labor; and we cannot wonder that this mode of procedure extended into the present century, although it has now happily long fallen into disuse. The errors of the present day are thus rather of the *nimia diligentia* category than the grosser blunder alluded to; but, in regard to the presentations which we are now considering, it may with truth be said, that the subject is one which demands careful attention at the hands of every one who would be an accoucheur and not a midwife, not less than the more familiar positions of the cranium.

It will have been inferred from what has already been said, that the duties and responsibilities of the accoucheur are, in the case of a pelvic presentation, greatly increased. In a cranial case, while all goes well, we look to the issue without a shadow of apprehension; and we absent ourselves, from time to time, without any consciousness of neglecting or evading a duty. But when the pelvis presents, all is altered in this respect. The risk, be it again repeated, is a fœtal, and not a maternal one; but, as we cannot tell the moment at which our assistance may be required, we must be much more strict and continuous in our attendance; and, so soon as the breech has descended in the pelvis, we must not leave the bedside of our patient until the delivery has been completed. This assiduity, on our part, does not involve, of necessity, any interference with the natural process. On the contrary, many cases will terminate happily without any aid afforded; so that we have two important points before us for solution in every case: whether we are to interfere at all; and, if so, how, and at what time?

Having fully satisfied ourselves of the exact position of the fœtus, and thus recognized the manner in which the mechanism will probably be conducted, we simply wait and watch the issue. If nature takes the ordinary course, and the breech descends, whatever its original position may have been, in a satisfactory manner, we do not presume to interfere, by in any way hastening or aiding the labor. At this moment, there is no special risk to the child, and, indeed, the slower the dilatation of the passage, the more effectual is that dilatation likely to be, and the safer and more rapid the subsequent passage of the head. So soon as the buttocks and lower limbs are born, we know that the critical period approaches; and some anxiety is not unnaturally felt as to the subsequent progress of the case, as a condition now comes into operation which constitutes one of the special dangers of pelvic births. This is compression of the umbilical cord, which, as the thorax approaches the ostium vaginæ, becomes jammed between the pelvic wall and the unyielding cranium,—a state of matters which, if complete and continuous, rapidly destroys the child, by interrupting the placental circulation. We should, at this stage, pull down a loop of the cord, thus obviating the probability of obstructed circulation by overstretching, and at the same time guide it, if possible, in the direction of either sacro-iliac synchondrosis,—where the risk of pressure is least,—choosing, if choice there be in the matter, that sacro-iliac synchondrosis which corresponds to the side of the child's head. Much useful information as to the prospects of the case is afforded by grasping the cord with the finger, so as to feel its pulsation. So long as this remains quite vigorous, the case is to be left entirely to nature; but we must repeat the observation frequently, as the descent of the head may expose the cord quite suddenly to fatal pressure,—a fact which it is of the highest importance immediately to recognize. The persistence or failure of funic pulsation are, in fact, the chief indications as to the necessity for operative interference.

Exceptional circumstances, no doubt, may arise to call for assistance at a stage even earlier than that which we are describing. Long detention of the breech within the cavity, owing to disproportion of the fœtal or maternal parts, or to *inertia uteri,* may call for action at an unusual period, on the same general principles as obtain in the case of obstructed cranial labor. The operative procedure proper to breech cases is, however, peculiar; and, if we fail, by the use of ergot or otherwise, to arouse the dormant energy of the uterus, or should we recognize an obstruction which natural efforts cannot overcome, we must be prepared to act with a view to speedy delivery. The forceps, being specially constructed for application to the fœtal head, are not available. The vectis, however, applied over the flexure of one thigh, while the hand of the operator is applied to the other, may possibly succeed; and the blunt hook is an instrument which has been frequently recommended in the management of such cases. No one can doubt the mechanical power of these, and especially of the blunt hook; but the danger of bruising, and even lacerating, the parts of the fœtus is not inconsiderable, so that such means should, if possible, be avoided. When the child is dead, and much force has to be employed, the blunt hook, and even the crotchet may be applied,—the use of which instruments will be more particularly detailed when we come to consider obstetric instruments and their use, under a special section. By the fingers alone, introduced over the groin upon the flexure of the thighs, the breech, in a very considerable proportion of ordinary cases, may be drawn down under the pubic arch, the operator remembering always, and imitating, as far as possible, the natural mechanism of the act. This is in all cases to be preferred as the safest; but, should it fail, a second mode is still available, which is much safer than and therefore to be preferred to any variety of instrumental delivery. What is required for the operation is a handkerchief, or, what we have found even more satisfactory, a skein of cotton yarn. One end of this is to be passed between the thighs and the abdomen, in the flexure of the groins, to the corresponding point on the other side, where it is to be seized, and pulled down.[1] In this, we have a powerful fillet, so adjusted that we may use a very considerable traction force, without any risk of injury.

The rule, however, is, as has been said, that we should interfere in no way whatever until the breech and lower part of the trunk have been born, when we direct our attention assiduously to the state of the cord. When the breech is born, and the legs lie between the thighs of the mother, and, in footling cases, even before the passage of the breech, an almost irrepressible desire may possess the accoucheur to grasp the limbs, and to bring the labor to a rapid termination. Such, it is to be feared, is not unfrequently the practice of those who have not taken some pains to master the mechanism of pelvic births. In many cases, doubtless, the result may be what is desired, but the hasty termination of the labor is thus purchased at an increased risk to the child. For, the result of thus forcibly dragging down the body of the child is to separate, unless the uterine contractions are unusually strong and continuous, the chin from the sternum, against which it has been hitherto applied. The consequent extension of the head may thus result in a faulty position; or, if the traction be continued, it may descend without undergoing the natural movement of rotation proper to the original position. The possible result of this is only too obvious, and arises from the fact that under such circumstances the child's head is delayed in the pelvis longer than if we had left the case to nature, and thus, at the moment of all others at which speedy delivery is desired, the head is detained, and the child is suffocated, owing to the blundering ignorance of the operator. But this is by no means the only manner in which his misplaced energy may defeat its own ends, for the separation of the chin from the sternum leaves a gap into which the hands are liable to slip from their position in front of the thorax, and from thence again to the sides of the head, which may thus, in a tight pelvis, be jammed at the brim. This, then, is an obvious error in practice which the young practitioner should carefully avoid, and in regard to which midwives should be specially instructed and cautioned.

The position of the hands, and even of the arms by the side of the head is an occurrence which, quite independently of unskilful interference, may spontaneously occur. Under all circumstances, it is an unfortunate complication, and requires, when recognized, immediate attention. So soon, therefore, as the lower half of the trunk has been born, and the cord has been looked to, we pass up the finger to ascertain the relative position of the arms. Should these be in the position of which we have just spoken as the natural one, no interference whatever is required, but if they are applied to the sides of the head, it will be proper to bring them down singly. Selecting that one which is most within reach, a finger is to be hooked over the humerus, close to the elbow joint, when the arm is to be gently drawn forwards, so as to cause the forearm to sweep over the anterior surface of the child. If dragged down roughly, and without any reference to direction, fracture of the humerus may occur, as has indeed often taken place in the hands of the ignorant or unskilful. The one arm being released, the head will probably descend a little further, and the other coming thus more into reach, is to be treated in the same manner. We must be careful, during the passage of the shoulders, that the perineum is neither distended in such a manner, nor in such a direction, as to endanger its integrity. The head, after the birth of the shoulders, now occupies the cavity of the pelvis, and the face, in almost all cases, will be found to have rotated into the hollow of the sacrum.

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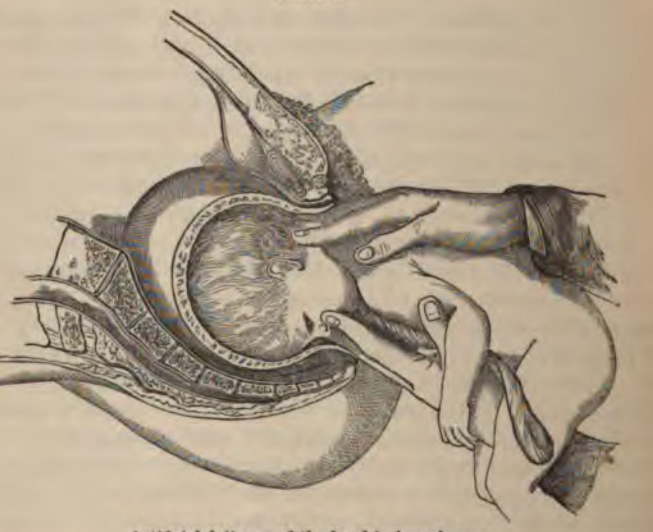
[1] In cases where this cannot easily be done, an elastic catheter, or some instrument of the nature of that which is used for plugging the posterior nares, might be advantageously employed.

This is the stage of greatest danger, and that at which the life of the child is most frequently lost. Consequently, this is the moment which requires the most constant attention, and at which assistance has generally to be afforded. The powers of nature are, in a large proportion of cases, quite sufficient to complete the delivery, so that even here there exists no necessity for operative interference as a point of routine duty. We must still, therefore, be guided by the circumstances of the case, and no single sign affords us more reliable information as to the urgency of the case than, as before, the funic pulsation. The cord, however, now becomes exposed to more powerful pressure, and, at the same time, the function of the placenta is seriously interfered with, if not wholly arrested. The absence, in breech cases, of the not inconsiderable quantity of liquor amnii which remains in ordinary presentations till the last, allows of the firm compression of this organ between the head of the child and the uterine walls; and, even should this not take place, the great contraction of the uterine vessels allows of but a scanty supply of maternal blood for the oxygenation of that of the fœtus. This, then, may truly be called a critical moment, in which, although placental respiration has all but ceased, aerial respiration is as yet impossible. A life trembles in the balance, and a few minutes, at furthest, will decide its fate. Impending death from asphyxia is indicated in such cases not only by a failure in the circulation of the cord, but by failure of the heart's action, as observed by the stethoscope, and by convulsive movements of the respiratory muscles. Such spasmodic attempts to fill the lungs with air are of the nature of reflex actions, excited probably by the contact of carbonated blood with the nervous centres. They indicate, therefore, impending suffocation, and call for immediate action. It is assumed, of course, that before matters have gone so far as this, we have in readiness such restoratives as may be approved of, hot and cold water, and the forceps—everything, in fact, which may be requisite, whether for the delivery of the child or its restoration, should it be born, as frequently occurs, in a state of suspended animation.

When the signs just mentioned indicate that the moment for operation has arrived, we must act without a moment's delay, a few seconds making all the difference between success and failure, life and death. The body and shoulders must not be grasped and pulled directly downwards, as is sometimes done. To do so would probably defeat our object, by pulling down the occiput towards the pubic arch, instead of favoring the natural movement of flexion; and besides, forcible traction of the neck is by no means free from the risk of causing instant death by injury to the spinal marrow. The following simple manœuvre answers admirably in ordinary cases, and will rarely fail to release the head. The body of the child rolled in a napkin is laid along the right forearm, which is then carried upwards between the thighs, so as to bring the back of the child quite towards the abdomen of the mother. Very gentle traction is all that is necessary to combine with this movement, in order to permit the extraction of the head, which is mainly effected, indeed, by the strong movement of flexion thus imparted to it. Should this fail, the same movement may be combined with extractive force, applied directly to the head by one or two fingers in the child's mouth, or what is better and safer, two fingers applied to the superior maxilla, one on either side of the nose. Many of the most eminent authorities recommend a method by which all traction on the neck is avoided. In this, which is represented in the annexed engraving, two fingers of the left hand are introduced, as above described, while the occiput is pushed upwards behind the symphysis by the corresponding fingers of the right hand. The movement of flexion essential to delivery is in this way effected, while the face and forehead are drawn forwards along the distended perineum. By such a proceeding some have succeeded in establishing respiration, even before the head was born; and with this object in view, Dr. Bigelow has recommended the use of a flat, flexible tube, which is to be passed within the vagina into the mouth of the child. All these manœuvres must be varied, in cases of occipito-posterior and other exceptional positions, in accordance with the natural mechanism of each case.

FIG. 120.



Artificial delivery of the head in breech cases.

If, however, the resistance is unusually great, we must, in preference to dragging upon the neck, apply the forceps without delay to the sides of the child's head, and thus complete the delivery. If the child does not at once breathe, the usual means described under suspended animation must be adopted, and persevered in, so long as the slightest chance remains of preserving the life of the infant. Any exceptional circumstances which may constitute impediments to delivery, must be managed on general principles; and, in extreme cases, it may even be necessary to perforate behind the ear, and allow the contents of the cranium to escape. Should the child be dead, many of the precautions above detailed will of course be unnecessary.

CHAPTER XX.

TRANSVERSE PRESENTATIONS: COMPLICATED PRESENTATIONS.

TRANSVERSE PRESENTATIONS: THE ARM OR SHOULDER THE PRESENTING PART—CAUSES OF—SIGNS OF, BEFORE AND DURING LABOR—PREMATURE RUPTURE OF THE MEMBRANES TO BE AVOIDED—DORSO-ANTERIOR AND DORSO-POSTERIOR POSITIONS—DETERMINATION OF EXACT POSITION BY OBSERVATION OF THE HAND—PROBABLE COURSE OF AN UNAIDED CASE—OCCURRENCE OF SPONTANEOUS EVOLUTION—SPONTANEOUS EXPULSION—METHODS OF OPERATIVE ASSISTANCE: PERIOD OF LABOR TO BE SELECTED: CEPHALIC VERSION: PODALIC VERSION: METHOD OF COMBINED EXTERNAL AND INTERNAL MANIPULATION: SPECIAL DIFFICULTIES—PROCEDURE MODIFIED IF CHILD DEAD—COMPOUND OR COMPLICATED PRESENTATIONS—HAND AND HEAD—HAND AND FOOT, ETC.—GENERAL MANAGEMENT OF THESE.

IN the Cross Birth of Hippocrates, the axis or long diameter of the fœtal oval is thrown across the womb—the most unfavorable position which could by any possibility be selected. There is scarcely a point on the surface of the trunk of the body in regard to which we may say that its presentation at the os uteri is impossible, and it is not to be wondered at, therefore, that some writers have described an infinite variety of Transverse Presentations. Experience has, however, shown that, whatever may be the case with a premature or putrid fœtus, the presentation of a mature and living child, which has unfortunately assumed this position, is generally a presentation of the arm and shoulder from the first. And, moreover, in the exceptional instances in which some portion of the dorsal, thoracic, or abdominal surface presents, it has been found that these are usually converted into arm presentations by the descent sooner or later of that limb. For these reasons, and for this additional one—that the mechanism in all transverse cases is essentially the same—cases of cross birth may be considered solely as arm presentations; and, when these have been fully described, it will be found that little remains to be specified in regard to the other possible presentations of the trunk. In point of fact, it is to presentations of the arm or shoulder alone that the terms "faulty" or "preternatural" are properly applicable. According to the elaborate statistics of Dr. Churchill, the superior extremities enter the pelvis in advance of the rest of the fœtus once in $231\frac{3}{4}$ cases.

The Causes of transverse presentation are, although obscure, probably somewhat less so than in the case of the breech. Any fault or deformity in the structure of the pelvic brim, which may act by preventing the descent of the head into the cavity, may turn aside, towards the iliac fossa, that extremity of the fœtal oval, when the shoulder may slip down and take its place. In like manner, an unusual quantity of liquor amnii may, by destroying the oval form of the uterus, indirectly encourage the displacement in question; while uterine obliquity, and a premature expulsion of the fœtus, are also admitted by most writers as circumstances which may possibly act in a similar manner. The unfortunate tendency to a recurrence of this, in women who have already had a child or children presenting by the superior extremity, would almost seem to indicate that some anatomical peculiarity of the parts may be the cause; and it was this which led Wigand to suppose that the form of the uterine cavity was the determining cause, and that, in those cases in which cross birth occurred, the transverse diameter of the uterus was in the first instance augmented, the long diameter of the cavity being thus relatively diminished.

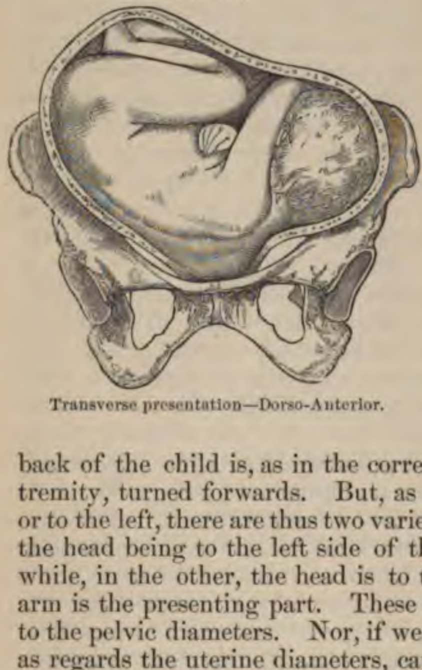
There are signs which, when distinct, may lead us, before the occurrence of labor, to suspect the existence of a transverse position; but it is very doubtful whether they can ever enable us to form a confident opinion, until the presenting part comes within reach of the finger. In many cases, the belly of the woman is peculiar in shape, and elongated in a transverse direction; and, if the abdominal walls are lax and thin, we may possibly be able to recognize a tumor in each iliac fossa, one of which is more resistant and spheroidal, and the continuity between which may be established on palpation. In every instance, the presenting part is unusually high, but the mere negative evidence of the absence of the head in the pelvic cavity can never be admitted as important. It has been stated that it is sometimes possible to distinguish the hand, elbow, or shoulder, through the anterior wall of the uterus, from the vagina; but this could never, under any circumstances, amount to more than presumptive evidence. Nor does the stethoscope give us any reliable information; but there may be cases, as Cazeaux observes, in which our diagnosis may receive some aid from this source. "If," he says, "the vaginal examination has resulted in the recognition of a portion of the fœtus which is of small bulk, and if we perceive the pulsations of the heart in the hypogastric region, we may almost certainly conclude that it is the superior extremity. If we heard the heart at the level of the umbilicus, it would in all probability be a leg." It happens, even more frequently in transverse than in breech presentations, that it is impossible to reach any portion of the fœtus with the finger alone in the earlier stages of labor; but, in some of these, the nature of the case will be recognized by introducing a portion of the hand. A marked effect of the height at which the fœtus stands, is slow and comparatively painless dilatation of the os; and, when the bag of water forms, it is, as in the case of the breech, very different in shape from that which precedes the head. In transverse presentations, the shoulder is the part which usually offers itself at the os uteri; but, as a considerable period often elapses before it comes within easy reach of the finger, it is often not recognized until labor has made some progress, a fact which bears in an unfortunate manner, as we shall see, upon the ultimate issue of the case.

It is, indeed, of the very highest importance that, if we have to deal with a cross birth, we should recognize the position as soon as it is possible to do so; so that the moment we discover a shoulder, an arm, or a hand, we should not desist until we have exactly, and to our perfect satisfaction, ascertained the position of the child. The prominence of the shoulder may be confounded with that of the tuber ischii, but may readily be distinguished by the absence of a similar tuber, at a little distance, with the genital organs between; and, should this negative evidence not be deemed sufficient, the finger passed towards the axilla, so as to feel the ribs, will remove, if they can be reached, such doubts as may remain. Care must be taken, in such manipulation as may be necessary, to avoid rupturing the membranes; for, so long as the child is not forced down upon the brim, and these remain intact, they are probably fulfilling their normal function of dilating the os, a process which should not, if possible, be interfered with. But, should the membranes be ruptured, or the shoulder be forced downwards into the cavity of the pelvis, and if we are still in doubt, it will be proper cautiously to pull down the arm and hand, which enables us not only to make sure of the presentation, but to recognize the particular position by a simple method to be hereafter described. There is no evidence that this procedure has any bad effect upon the progress of the case or otherwise, and the unanimous opinion of the most experienced accoucheurs is that, if carefully done, it is quite free from risk. But, even if a certain amount of risk necessarily attached to the operation, we would be perfectly justified in incurring it, in preference to attempting the management of the case without certain knowledge as to the position of the child. Some difficulty might occur in distinguishing the parts if not within easy reach. The manner in which the hand is to be made out under such circumstances has already been referred to in the preceding chapter; but if, as will generally be observed, the arm hangs down into the vagina, there can be no difficulty whatever in distinguishing it from the lower extremity even by the unexperienced. The anatomical characters of the knee and elbow would enable us to distinguish also between these parts in the unlikely event of such a difficulty arising.

We have alluded to the caution to be exercised in manipulating, so as to avoid premature rupture of the membranes. There is, however, one advantage in this mode of procedure to which we have not alluded: this is the possibility of rectification of the transverse position. This has been observed by competent persons too often as a spontaneous occurrence, to admit of doubt as to its being an exceptionally fortunate issue of the difficulties of such a case; but, it must be manifest that no such alteration in the axis of the child can occur when the waters have drained away, and it is grasped firmly by the uterus and forced in part into the cavity of the true pelvis. And not only this, but we have every reason to believe that the change may, in favorable circumstances, be effected by skilful manipulation, and more especially by a method to be afterwards described, which is best known as that of Dr. Braxton Hicks.

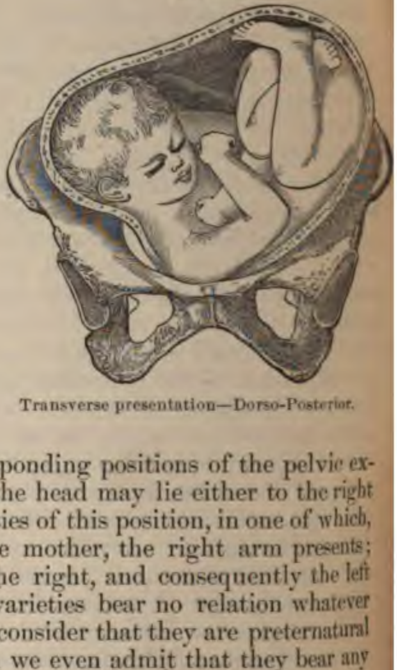
If we except certain complicated and unusual cases to be afterwards alluded to, we may refer all transverse presentations to two varieties,—Dorso-Anterior and Dorso-Posterior—of which the former is more frequent in the proportion of two to one. In *dorso-anterior* positions the back of the child is, as in the corresponding positions of the pelvic extremity, turned forwards. But, as the head may lie either to the right or to the left, there are thus two varieties of this position, in one of which, the head being to the left side of the mother, the right arm presents; while, in the other, the head is to the right, and consequently the left arm is the presenting part. These varieties bear no relation whatever to the pelvic diameters. Nor, if we consider that they are preternatural as regards the uterine diameters, can we even admit that they bear any such possible or practical relation to these, as would warrant us in placing them in the same category as the positions of the ends of the fœtal oval, which we have hitherto been considering. There is here no question—primarily at least—of oblique, transverse, or conjugate diameter, so that a separate description of the two varieties of dorso-anterior position is quite unnecessary. The same remark applies to the *dorso-posterior* position, which in like manner offers itself for consideration under two varieties. In one, the head is to the right, and the right arm presents; in the other, the head is to the left, and the left arm presents. As regards the two principal positions, mentioned, as well as their varieties, it is unnecessary to enter upon any elaborate description, as the management is in all cases essentially the same. The nature of the operative procedure which, in the great majority of instances, is necessary in

FIG. 121.



Transverse presentation—Dorso-Anterior.

FIG. 122.



Transverse presentation—Dorso-Posterior.

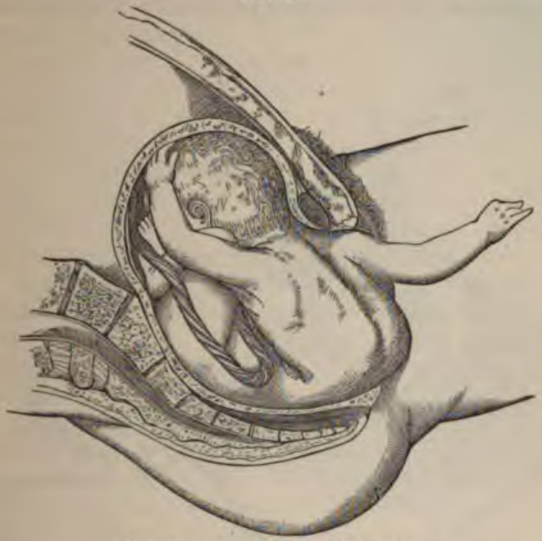
the treatment of transverse presentations, renders it important that we should begin by ascertaining the exact position of the fœtus. Indeed, should we make a mistake in this particular, we know of a certainty that our error adds to the maternal risk, which is already considerable. Of great importance, therefore, is it that we possess the power of discriminating between the four varieties of transverse presentations which have been alluded to.

The points which we wish to ascertain are,—to which surface of the womb, anterior or posterior, is the Back of the child turned? and, to which side, right or left, is the Head directed? To ascertain this by passing the hand within and around the womb would of itself be a serious operation; but we have fortunately a safe and certain means by which, under all ordinary conditions, we may at once determine the exact relation which the child bears to the uterine walls, and so modify our operative manipulations accordingly. The information in question is to be derived from a careful examination of the arm which presents. Prior, therefore, to any operation which we may find it necessary to perform, with a view to the rectification of this faulty position, we must pull down the arm, and carefully observe it, unless, indeed, our examination of the presenting shoulder, and the parts beyond, should have sufficed clearly to establish the position of the child. The point to be first ascertained is, as to the presenting arm, whether it be right or left. This is determined, in the simplest possible way, by the accoucheur placing the palm of his hand against the palm of the child's hand, when, *if the thumbs correspond, so do the hands.* For example, if he employs, as most people do, the right hand, and finds the thumb of the child correspond to his little finger, he knows that it is the left hand, while if he finds them thumb to thumb, it is the right. This is a certain guide, and one in reference to which there is no possibility of fallacy; but the information which is thus afforded is but limited, and only indicates that we have to deal with one of two possible positions. A more careful examination of the hand gives us complete and certain information, so that we know exactly where to find the anterior and posterior surfaces, and the head and feet of the child. The following rule is all that it is necessary to remember,—*The hand of the child being supine, the Palm corresponds to the abdominal surface and the Thumb points to the Head.* Here, however, there is a possible source of error, which, if not avoided, will inevitably lead to wrong conclusions. For, a moment's consideration will suffice to show that, if we omit to make sure that the hand is supine, we run the risk of its being pronated, which, by turning the palm towards the back, and the thumb towards the feet, may lead us to form an opinion which is, in every respect, wrong. Before making the observation, therefore, be sure that the hand is supinated—when error becomes impossible.

When the body of the child presents at the brim of the pelvis, in a transverse position, the labor almost invariably requires at the hands of the accoucheur the assistance of art. Indeed, it may be said that, if the pelvis be normal, and the fœtus living, mature, and of average size, it is impossible for the woman to be relieved by the unaided efforts of nature. The progress and termination of such a case would probably be as follows: After a tedious first stage, in which the dilatation of the os is unsatisfactorily effected, the membranes rupture, and the arm descends into the pelvis, either primarily, or, when the shoulder originally presents, after the labor has made some further advance. When this occurs the pains become much more severe and strong, and with each succeeding effort the shoulder is forced down and wedged into the cavity of the pelvis. The head being situated, however, to one side, and the breech to the other, progress beyond a certain point is manifestly impossible, so that when the utmost degree of moulding is attained of which those parts are susceptible, and the base of the wedge has entered the pelvis as far as the mechanical conditions will permit, no amount of uterine or other propulsive effort can produce the slightest effect. Left to nature, and attended with powerful uterine action, such a case must ere long involve the life of the child, not less by the great and continuous pressure on the neck and other vital parts than by the implication, from the same cause, of the placental circulation. The actual degree of the pressure is further shown by the tumefaction of the limb which hangs down into the vagina, or protrudes partially from the ostium vaginæ. The sufferings of the mother are in no way alleviated by the death of the child, but, on the contrary, every minute of such fruitless effort renders her position more and more precarious. The continued pressure on the soft parts of the parturient canal may destroy in this way the vitality of those portions which are most exposed to its influence, when sloughing, more or less extensive, will occur, from the effects of which, coupled with the prostration and exhaustion which gradually wear out her powers of constitutional endurance, her sufferings are terminated by death. Or, at any stage of the labor, rupture of the uterus may occur, and a similar result will necessarily ensue.

Under certain circumstances, however, such as a putrid or immature fœtus, or a pelvis of unusual size, nature may relieve herself by a spontaneous process of delivery. One of these processes is associated with the name of Denman. This distinguished obstetrician found that, under conditions similar to those above noted, what he termed *Spontaneous Evolution* occasionally occurred. In those cases, the shoulder, or point of the wedge, did not maintain its position in the pelvis, but moved upwards, during the continuance of the pains, towards the brim of the pelvis, on that side which the head originally occupied, the head itself moving in a corresponding direction in the iliac fossa. This ultimately made way for the nates, which descended towards the floor of the pelvis, when labor terminated as in a case which had been from the first a presentation of the breech. This observation of Denman's was hotly controverted by some of the most eminent obstetricians of the day, with the ultimate result, however, of establishing the correctness of his views. The controversy, moreover, by directing general attention to the phenomena of spontaneous delivery, resulted in a thorough elucidation of the whole subject, from which it transpired that there was another process, and one of more frequent occurrence, according to which a similar result ensues. The credit of first describing this is generally attributed to Dr. Douglas, of Dublin, who, to distinguish it from the process of Denman, called it *Spontaneous Expulsion*. The mechanism of this differs essentially from the former, as

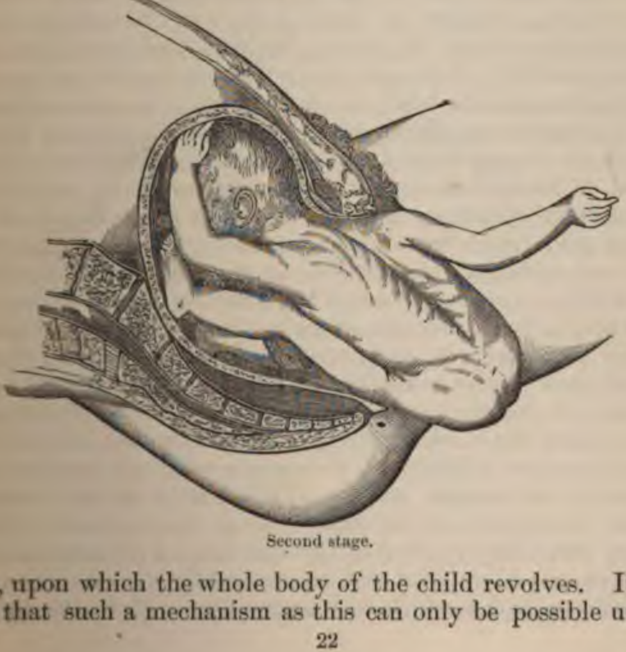
FIG. 123.



Spontaneous expulsion. First stage.

the shoulder, instead of ascending, continues to descend, until it becomes fixed against the subpubic arch, when it is arrested and forms

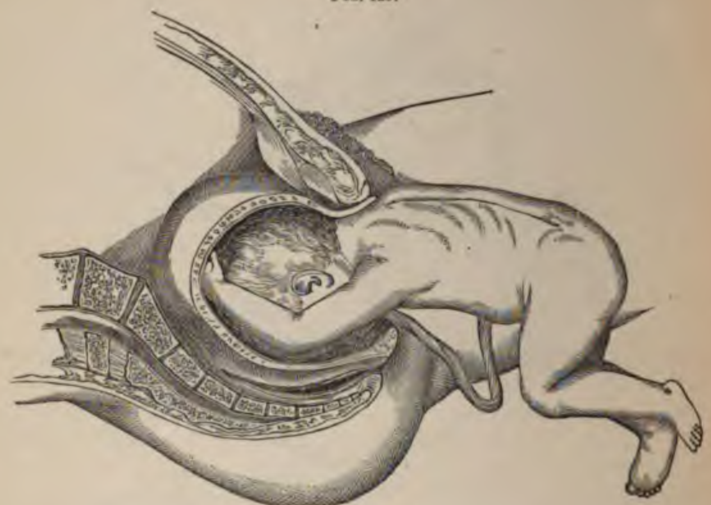
FIG. 124.



Second stage.

a centre, upon which the whole body of the child revolves. It will be obvious that such a mechanism as this can only be possible under the same exceptional conditions which permit of spontaneous evolution. For in this case the breech must pass the pelvic brim, which is already partly occupied with the base of the skull—an occurrence which is manifestly impossible, if the relative proportion of the parts—maternal and fœtal—are in accordance with the normal standard. The mode in which the successive stages of the expulsion actually occur is shown in the accompanying figures, in which is depicted the manner in which, while the child revolves, the thorax, buttocks, and remaining shoulder succeed each other in their passage over the distended perineum. All being thus born but the head, the delivery of that part may either be effected by the natural efforts, or with the assistance of the accoucheur in the manner already fully described in the last chapter. The long-continued, ineffectual efforts of the uterus, resulting in complete atony of its muscular structure, may at this stage cause the death of the woman by hemorrhage so profuse that all our efforts are powerless to arrest it—an unhappy result, which is more likely to occur in those cases in which operative assistance has been too long delayed.

FIG. 125.



Third stage.

There are, perhaps, no cases occurring in the practice of midwifery which call for more tact, judgment, and operative skill, than those which are now under consideration. The object of all operative interference is the rectification of a preternatural position, so as to place the axis of the child in correspondence with the axis of the uterus, and thus permit of delivery in consonance with the mechanical laws which govern the normal process. Deliberately to leave the case to nature, on the chance of the occurrence of spontaneous evolution or expulsion, would be irrational in the extreme. For, although the risk of operative procedure must not be underestimated, we may be quite certain that the danger which will accrue from delay is vastly greater, inasmuch as the child's life is sacrificed, and that of the mother is placed in imminent peril. It is scarcely possible in these days that, in this or any other civilized country, a woman would be suffered to die undelivered, for sooner or later assistance would be sure to reach her. Such assistance, however, there is too good reason to believe, may be afforded at a period when the vital powers have already begun to flag, when the arm and shoulder are already wedged down in the pelvis, and when the life of the child has long been destroyed. All these circumstances increase very greatly the gravity of the case, and may often lead us to despair as to its ultimate issue; but, whatever the difficulties may be, the educated accoucheur must be prepared to cope with them, and to act in every case, even the most desperate, in such a manner as may at least give the mother what chance human skill can afford her. No one point, therefore, is of such importance as this,—that we should recognize the position at the earliest possible moment. If we have the good fortune to do so early in the labor, we may look upon the case with calm self-reliance, knowing that the issue lies in a great measure in our hands. No pressure having at this time compromised the life of the infant, we hear its heart beating vigorously, and we may possibly feel it move; while the maternal parts have as yet been subjected to no mechanical violence. No details are requisite to prove that, in the two classes of cases referred to, the prospect of success is very different, and we therefore repeat that nothing, in point of importance, is to be compared with an early recognition of the case. This enables us, moreover, to select the time at which we may act with the greatest probability of success.

The choice thus afforded us must be taken advantage of with discrimination, and in full view of the facts which have been detailed. The responsibility which devolves upon the accoucheur in such a case, renders it essential that his services should be at command on any emergency, as in the event of the moment favorable for operation arriving somewhat earlier than he might perhaps have been prepared to expect. For, as will presently be made apparent, this period may be of short duration, and if it be not taken advantage of, the case may pass very rapidly into another category, in which the risk to mother and child is greatly increased. It is of the first importance, as has already been mentioned, that the integrity of the membranes should be preserved as long as is possible. Any clumsiness or violence of manipulation during the course of an ordinary vaginal examination, may thus, by causing the escape of the waters, not only permit of the descent of the abnormal presentation, but may, by complete evacuation of the liquor amnii—upon the same principle as in pelvic presentations—bring the uterine walls into immediate contact with the surface of the child. This is all the more likely to occur if we examine during a pain, so that we should carefully avoid examination at this moment, or at least conduct it with special caution. The patient is to be confined strictly to the horizontal posture, but so long as the child is alive, the os but partially dilated, and the presenting part still high, it is better to wait than to attempt a forcible dilatation of the os, which would most likely involve a rupture of the membranes. This is the period, however, at which an attempt at rectification may be made with considerable prospect of success, if we combine the use of the finger internally with the external manipulation of Wigand, according to the method recommended and practiced by Dr. Braxton Hicks. After having ascertained the exact position of the child, or at least the side to which the head is turned, this may be effected by pressing the shoulder upwards from the vagina, while the head is pressed down towards the brim of the pelvis, and if necessary retained there, by the other hand which is applied to the surface of the abdomen. The process effected by this manœuvre is what is termed Cephalic Version. The same result has been successfully attained by Hamilton, Gooch, and others, by manipulation which is purely internal, and by Wigand and Martin, by a method in which the manipulation is exclusively external, but it is to the distinguished obstetrician named above that we owe the combined method.[1] This subject will be more fully noticed under the head of Turning in a special chapter, so that we shall only mention here such points as are incidental to the peculiar case which we are now considering.

The treatment, according to almost all authorities, which is most applicable to transverse presentations, is the operation generally known as Turning or Podalic Version, to be afterwards more particularly described. Should this operation be determined upon from the first, the condition of the membranes is of even greater importance than before, and the state of matters which is most favorable to its successful performance is to be found when the os is in such a condition, as regards dilatation or dilatability, as to permit the passage of the hand, while, as yet, the liquor amnii has not escaped. Waiting patiently till full dilatation has been attained, or till rupture of the membranes takes place, increases in no way, as we have seen, the risks of the case. But, so soon as either event occurs, we at once proceed to the operation by introducing the hand, seizing the feet, and bringing them towards the os uteri, whence the shoulders will recede, under such circumstances at least, without difficulty. The mode previously detailed of ascertaining the position of the child by observation of its hand must here be practiced if necessary, as the result of an error in this respect, or a haphazard introduction of the hand within the womb, will greatly increase the risk to the mother which attends the operation, even when most skilfully performed. The position of the child being ascertained, the palm of the child's hand will indicate the abdominal surface, to which the hand of the operator should always be directed, while by pushing the hand in the contrary direction to that in which the thumb points, the feet will most easily be attained, and at a minimum of risk. In this case also, the method of combined version is equally applicable as for cephalic version. And it requires no argument to show that, if it be practicable thus to effect the object in view, an operation which consists in the introduction of one or at most two fingers into the uterine cavity, must involve less risk than necessarily attends the ordinary procedure of turning by the feet. That it is practicable, we have had several opportunities of demonstrating, and it is without any hesitation, therefore, that we recommend that this method should in the first instance be tried in every case, and the more severe operation only in those instances in which the former fails. As in cephalic version, it is better to attempt rectification so soon as the os has sufficiently dilated to admit the finger, and to permit an accurate diagnosis. With the escape of the waters, the mobility of the fœtus is, for obvious reasons, diminished.

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[1] See Dr. Braxton Hicks's Memoir "On Combined External and Internal Version." London, 1864.

The following, from Dr. Hicks's published cases, is a striking instance of how, even under most unfavorable circumstances, combined version may be practiced with perfect success.

"Mrs. M——, admitted into Mary Ward in April, 1861. The antero-posterior diameter of pelvic brim measured only two inches and one-eighth, which had caused her labor to be accomplished with the greatest difficulty; embryotomy being employed on the last occasion, although brought on at the seventh month. Labor was induced on 13th April last, in the seventh month of this, her fourth pregnancy, by puncturing the membranes. Pains came on in about sixty hours, after which they continued to increase for twenty-four hours, at intervals of five minutes. The os uteri was then about the size of half a crown, still unyielding, scarcely admitting two fingers. The liquor amnii still existed in small quantities, draining slowly away. The shoulder presented, the head being to the right side, the breech to the left, but both approaching the fundus, the child being somewhat doubled on itself. As it was of much importance to rectify the presentation before the os dilated, so that the presenting part might not be driven lower down; and as the footling presentation seemed, with so narrow a brim, and a small soft head, to give the best chance for the life of the fœtus, I decided on attempting podalic version. The patient was put under the influence of chloroform. The left hand was introduced into the vagina, with two fingers through the os, and the presenting part pushed in the direction of the head, while the right hand pressed down the breech from without. The fœtus did not glide round in the uterus very easily, for it was tightly clamped by it, and every movement within or without produced uterine action, consequently it required a little patience; but by varying the position and direction of the outside pressure, the foot was at last drawn into the os by two fingers. The chloroform was discontinued, and after about half an hour, slight expulsive pains appearing, gentle traction was made upon the child. It was not long before the os dilated and the child was brought down during the pains. Some detention of the head took place at the brim, in consequence of the very narrow antero-posterior diameter, and the child's life was lost. The mother did very well."

The really difficult cases, and those in regard to which apprehension will naturally arise, are those in which we have to act after the shoulder has descended in the pelvis, and when the body of the child is tightly embraced by the womb. No attempt should be made under any circumstances to replace the hand and arm, should these have prolapsed; and it will generally be proper, before proceeding to operate, to allay the excited irritability of the uterus, which shows a spasmodic tendency to contract under the slightest stimulus. Of various means at our command, that which is most suitable for this purpose is chloroform, and if the patient be well brought under its influence, it is wonderful to what extent we succeed, in some instances, in relaxing the parts, so as to admit of the easy passage of the hand. In every case, however, such an operation is attended, as compared with one performed at an earlier stage of the labor, with greatly increased risk, the danger being in direct proportion to the amount of resistance encountered in an attempt to pass the hand. The condition of the bladder and rectum should, as a matter of course, be ascertained, and, if necessary, those viscera emptied before any attempt is made at rectification. A peculiar and special resistance may proceed from the state of the os, which, if rigid, may constitute a barrier to the passage of the hand. In this case, if the waters have escaped, and the probability of its dilatation within a given time is thus a matter of great uncertainty, we must endeavor to dilate the os, either by the finger in a manner which will be afterwards described, or by means of some such mechanical appliance as Barnes's bags, and then proceed in the usual way. We may be summoned in cases in which, although the wedging of the shoulder is complete, clear evidence is afforded us of the death of the child. The proof of death may consist either in the signs of actual putrefaction, when the skin will peel off the presenting part, in the observation of a flaccid and pulseless funis, which is not unfrequently prolapsed in these cases, and in the absence of fœtal pulsation and movement; of which signs the first two may be regarded as certain, while the last is to be accepted with caution. Our procedure here is to be modified by the fact that we have now no longer the interest of the child, but that of the mother alone to look to, so that our object simply is to deliver her in such a manner as may subject her to the smallest possible risk. We make no attempt therefore, in this case, to turn, but at once reduce the bulk of the child by evisceration, and then proceed to extract it in the manner which may seem safest and best.

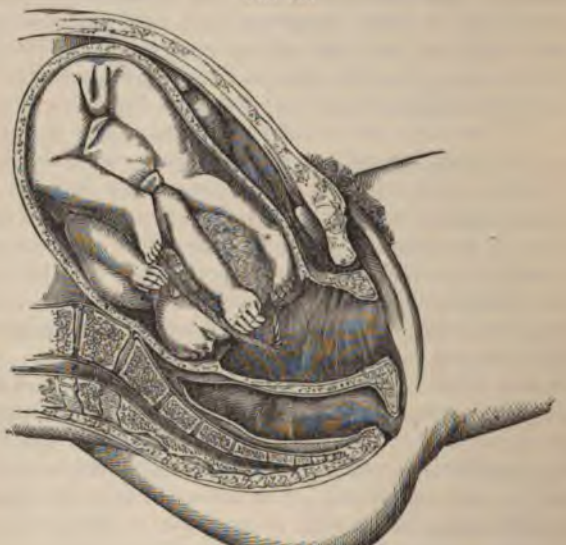
In a very few cases, in which the special circumstances favorable to such an occurrence are present, it may be obvious that the case is about to terminate spontaneously, according to the methods of Douglas or Denman. This will be recognized in each case by careful examination,—more especially during the pains,—which will enable us to make out that the process of revolution is being gradually effected. Delay is, under such circumstances, quite proper, more especially when the child is dead; in which case, indeed, we might assist the process materially by the aid of the crotchet or blunt hook. With reference to the more frequent of the two processes, Dr. Douglas says, "If the arm of the fœtus should be almost entirely protruded, with the shoulder pressing on the perineum; if a considerable portion of its thorax be in the hollow of the sacrum, with the axilla low in the pelvis; if, with this disposition, the uterine efforts be still powerful, and if the thorax be forced sensibly lower during the pressure of each successive pain, the evolution may, with great confidence, be expected."

Compound or Complicated Presentations.—In addition to the various presentations already described, there are many others, of rare, though possible occurrence, in which certain parts anatomically distinct from each other, come together towards the os uteri. Most of these presentations are varieties, more or less distinct, of the transverse position; but in some, again, the coincidence of the long axis of the child, with that of the uterus is maintained. We shall only mention here one or two of the many possible compound presentations. When the Hand and Head present together, the mechanism of natural delivery is, of course, complicated to the extent of the diameter of the arm. In a pelvis of large, or even of ordinary dimensions, there is nothing to prevent a satisfactory termination of the labor; but, if the pelvic diameter should chance to be ever so little out of proportion, the presence of the arm may make all the difference in the world, and suffice to jam a head which would probably have passed, under the ordinary conditions, with very little more difficulty than usual. Nay, even when a hand presents on either side of the head, there is nothing absolutely to prevent the birth of the child, which has, in fact, been observed to pass, under such circumstances, without any marked difficulty whatever; so that, in both of these instances, we have to deal with conditions very different to those which obtain in cross-births. But the chance of delay and protracted suffering is sufficient warrant for us, in such cases, to attempt a rectification of those positions, if only this can be effected without incurring the risk of making matters worse. What we wish to do is to push the arm upwards, so as to allow the head to descend, and alone to occupy the cavity of the pelvis. In making such an attempt, however, we must be particularly careful not to displace ths head; for if the result of our interference were to be that the head was moved from the brim to the iliac fossa, and the shoulder thus permitted to descend, we would, in plain language, find that we had converted a tolerably easy position into one of the most unfavorable which it is possible to conceive. For this reason, it is generally better to avoid all such attempts until the head has entered, or is becoming engaged in the pelvic brim. If we then use ordinary caution in our manipulation, we may attempt, without hesitation, to effect our object by pressing the prolapsed limb steadily upwards; and, along with this, we may try to retain the head against the brim, in such a manner as to prevent the slipping down of the arm, until the uterine efforts have caused the head to descend so far that this is no longer possible. This latter indication has been successfully fulfilled by combining external with internal manipulation, and that in a manner which would encourage us to repeat the manœuvre on any occasion which might occur.

The Feet and Hands, or one of each may present, and thus constitute what may be termed an unusual variety of transverse presentation. It is a common occurrence, in this variety, to find prolapse of the funis as a further complication, and one unfortunately which will add in no small degree to our perplexity. As we could scarcely expect in such a case to replace both limbs, and as prolapse of the cord of itself involves very serious danger to the life of the fœtus, the very obvious and proper procedure is to drag down the inferior extremity, and thus complete podalic version. For, if we leave it to nature to select by which of the poles of its long diameter the child will descend, it is more than probable that the shoulder will slip down, and the difficulties of the case will then be very greatly aggravated. Or, as is still more likely, the upper and lower limbs will together become wedged into the pelvis, and the progress of the labor be as effectually barred as in the ordinary transverse position. If the mobility of the fœtus within the womb is as yet not seriously interfered with, no great difficulty will be incurred in the operation, and as the child revolves, its arm will leave the vagina and follow the head in its movement towards the fundus. But, if the child is so firmly grasped by the womb as to render the operation unusually difficult, the woman must be put under the influence of chloroform, and a fillet attached by a running noose above the ankle (see chap. xxxii), when steady traction upon this, combined with pushing up the arm, and with the further aid of external manipulation, to be afforded by an assistant, will usually effect the version. Should the cord have formed one of the elements of the original position, great attention must be paid to it, in order, if possible, that it should retreat into the uterine cavity along with the superior extremity; failing which, it should be guided into that part of the pelvis where it is least likely to be exposed to injurious pressure. The case, otherwise, is to be managed as an ordinary footling presentation, and delivery slowly or rapidly effected according to the urgency of the symptoms and the other attendant circumstances.

Positions more complicated still may be, although rarely, encountered. We may have, for example, the Hand and Foot presenting along with the Head, or we may have, as in the case which is represented in the accompanying engraving, a presentation of the Head, Hand, Foot, and Cord. All such cases are to be managed on similar principles by the performance of podalic version. In the case in question, the whole of the presenting parts were tightly jammed in the pelvis, the child firmly embraced by the uterus, and the cord flaccid and pulseless, before it was brought under our observation. The woman had previously borne several children at the full term. Although greatly exhausted by a fruitless labor of many hours' duration, her pulse was of tolerable strength; and it was resolved, after the administration of some stimu-

FIG. 126.



Case of complicated presentation.

lants, at once to proceed to the operation. Version was, however, in this instance, only effected with extreme difficulty, in the manner above described, by the hand and the fillet. When the child was born it was found to assume, as if from imperfect cadaveric rigidity, the position which it had occupied within the pelvis. This was so characteristic that a cast was taken, of which the drawing is a tolerably correct representation. Other presentations, in addition to those enumerated, may, as we have said, be met with, but the above will suffice to indicate the general principles upon which the treatment of all such is to be based.

All cases of transverse and complicated labor are attended with greatly increased risk as regards the child; and even under the most favorable circumstances, with a considerable addition to the dangers which women undergo in childbed. In the former class it has been found that, even including those cases in which the most skilful assistance has been afforded, more than a half of the children perish, while, as regards the mother, the deaths are about one in nine. The fatality in both depends, in a very great measure, as all experience has shown, upon the period or stage of the labor at which assistance is first afforded.

CHAPTER XXI.

FUNIS PRESENTATION.

"PRESENTATION" AND "PROLAPSE" OF THE CORD—RELATION OF THE FUNIS TO OTHER PRESENTATIONS—CAUSES OF—SYMPTOMS OF AT VARIOUS STAGES OF LABOR—GREAT DANGER TO CHILD—TREATMENT: AT FIRST EXPECTANT: AVOID RUPTURE OF THE MEMBRANES: REPOSITION BY THE FINGERS; BY MECHANICAL APPLIANCES: VARIOUS REPOSITORIA DESCRIBED: POSTURAL METHOD: USE OF THE FORCEPS: TURNING.

SOME writers have, without any obvious advantage, drawn a distinction between "presentation" and "prolapse" of the Umbilical Cord. By the former term is implied those cases only in which a portion of the cord is situated in the lowest part of the amnionic cavity, so that it may be felt from the vagina; either through the inferior portion of the uterine wall, or through the membranes when the finger can be passed by the os. Prolapse, again, is restricted to cases in which, after the rupture of the membranes, a loop of the cord passes into the vagina, or even hangs from the vulva—in both cases preceding that portion of the child's body which presents at the os uteri. Such a distinction as this is, in so far as classification is concerned, obviously useless, seeing the Prolapse is merely a more advanced stage, and an almost inevitable sequence of the Presentation.

At the beginning of labor, the funis may present alone at the os, and may be felt to occupy the bag of waters before the child has descended; or, what is more usual, it descends along with the cranium, nates, shoulder, or any other part of the fœtus, becoming prolapsed only when the membranes give way. Presentation of the cord is an occurrence which, although not very frequent, is so hazardous, as regards the life of the child, that we cannot pass it by without careful attention. Considerable discrepancy exists as to the frequency of its occurrence, and it has been variously stated by competent and experienced observers at from 1 in 37 to 1 in 382. There can be little doubt that it often occurs without its being recognized—in those cases chiefly in which the loop is small, and the prolapse consequently trifling. This may, in some measure, seem to account for the discrepancy alluded to; but we may confidently accept of the statistics carefully compiled by Dr. Churchill—which, on a total of 90,983, give one case of funis presentation in 282—as indicating, approximately at least, the state of the case. It is in the positions of the cranium that presentation of the cord most frequently occurs—a fact which depends wholly upon the great preponderance of these as compared with the other positions of the fœtus. Considered, however, relatively to transverse, breech, and other presentations, we find that it is most frequent with the shoulder, then with the breech, and, in point of fact, is more likely to occur in any given position (relatively to its actual frequency) than in cranial cases, where the ball-valve formed by the head is, as we shall show, less likely than any other part to admit of the descent of the coil. Scanzoni brings out the following as the result of his experience:

Funis presenting once in 304 Cranial Cases.
" " " 32 Face Cases.
" " " 21 Presentations of Pelvic Extremity.
" " " 12 Transverse Presentations.

The *Causes* of funis presentation vary according to the position of the child, and are also influenced by other circumstances. Among the predisposing causes, an unusual quantity of liquor amnii is a condition which, by separating the uterine walls from the surface of the fœtus, must certainly encourage the displacement in question; and it is mentioned by Scanzoni that, in more than a third of the cases observed by him, an unusual quantity of liquor amnii existed. Probably the larger the quantity the more likely would be the descent of the cord; so that in cases of Dropsy of the Amnion we would anticipate the possibility of such a displacement. In the case of a cord of unusual length, the conditions are also such as singularly to favor its gravitation downwards, either prior to the rupture of the membranes, or during the escape of the waters, when the loop suddenly slips down along with the gush of fluid. In cases where the placenta is inserted near the os, and the cord lies, consequently, in its immediate vicinity, the danger of prolapse must manifestly be increased, and will, on the contrary, be reduced, the further the site of the placenta is from the lower segment of the womb. It is doubtful whether a pelvis of unusually large size favors, as some have supposed, the descent of the cord; in fact, we are inclined to believe that so far from this being the case, the unusually deep position in the pelvis of the presenting part, in these cases, is more likely to prevent the accident, by a firmer contact than usual with the inferior part of the uterine cavity. But it is otherwise with a narrow pelvis, and more especially in such instances as show marked contraction at the brim. In these the descent of the presenting part, and the occupancy by it of the inferior part of the womb, are mechanically hindered to such an extent that the cord is either forced down by the uterine contraction into the bag of waters, or, upon the escape of these, is carried past the arrested head by the impulse of the momentary torrent. Cases of this kind have been recorded by Mr. Roberton, of Manchester, who has paid particular attention to the subject.

There is, probably, no cause which acts more decidedly in producing this unfortunate position of the cord than the presentation of the child. The more thoroughly is the lower region of the womb occupied by the corresponding portion of the child, the less likely is prolapse; and we find, therefore, that the less effectively this condition is maintained, there is, in direct proportion, increased danger to the cord. In the case of cranial positions, a very superficial observation of the facts of the case will suffice to show how admirably adapted these are to the mechanical prevention of the displacement in question. It is true, indeed, that it is not the head which, in the first stage of labor, presses during a pain upon the os, and it might be assumed, as by no means improbable, that the cord should slip down into the interval between the membranes and the head. But a more close attention to the mechanism of a labor-pain,—which has been fully described in a previous chapter,—shows that nature, apparently, provides against the possibility of such a movement on the part of the cord, by commencing the contraction in the cervix, from whence it passes upwards, and thus, by a sort of peristaltic contraction, maintains the relative position of the parts, which is only likely to be disturbed, under such peculiar circumstances as have been above detailed. So soon as rupture of the membranes permits of the immediate application of the head to the circumference of the os, the same action, beginning in the sphincter fibres of the uterus and exercised equally upon the spheroidal cranium, still more effectually prevents displacement.

It is widely different in the other presentations of the child, which we may here consider together. In the case of the face, the conditions approach more closely to those of vertex positions than any other; and we thus find, as we might have anticipated, in the table quoted above from Scanzoni, that these are, next to the cranial positions, the most favorable. As regards the presentation of the nates, we have here also a rounded mass, occupying the lower segment of the uterus, in a manner which in most cases is sufficient to maintain the position of the cord. That its descent occurs in a much larger relative proportion of cases than in cranial positions, is to be accounted for by various circumstances. We cannot fail to observe, in the first place, that there is not the same regularity in the circumference of the presenting breech as in the case of the head. There are thus, necessarily, various points at which the contact between the uterus and the presenting mass is comparatively insufficient, so that the cord may easily glide down at those points where the resistance is least. We can easily conceive it possible that in this manner a loop of the cord may pass down over the genitals in the interval between the nates, and make its appearance in the vagina, or externally. Should the presentation be one of the knees or feet, the conditions favorable to a descent of the cord are even more exaggerated. It is in transverse presentations, however, that the cord most frequently descends along with, or in advance of, the presenting part. There is, in this case, but little to prevent the displacement in question; and neither the shoulder nor the arm can be looked upon as, in any sense, the mechanical equivalent of the cranium. And what makes matters worse, in the case of cross birth, is the proximity, in every case, of the umbilicus to the os uteri, which must still further multiply the conditions favorable to displacement. But, of all possible cases, those in which prolapse or presentation of the funis is most likely to occur are what have been described in the preceding chapter as complicated presentations,—such as hand and head; hand and foot; head, hand, and foot; and the like,—in which the conditions favoring prolapse reach their maximum.

Sudden rupture of the membranes, with the accompanying gush of waters, has been placed by some in the first rank as a determining cause of prolapse of the funis. This is claiming for the phenomena in question too important a position. No one can deny that "prolapse" of the cord usually takes place at this moment, but the determining cause of the displacement has, probably, in almost all these cases, been previously in operation, and has already induced a descent of the cord, as far as, prior to the moment of rupture, is possible. It may, no doubt, happen that, under special circumstances, such as abundance of the liquor amnii, a loop of the cord may be carried down past the presenting part along with the fluid; but the usual occurrence, we apprehend, is that the prolapse at the moment of rupture is merely a more advanced and complete stage of previous displacement.

The *Symptoms* by which this accident is to be recognized vary according as the membranes are intact or ruptured. In the former case, the diagnosis is attended with considerable difficulty, inasmuch as we can only be guided by the sense of touch through the membranes or the thin uterine walls. It is quite possible, at this stage, to mistake the inequalities which are presented by the fingers and toes for the irregularities due to the twisting of the cord; and, in such cases, the only sign upon which we can confidently rely is the observation of the umbilical pulse. This is, however, not always easily made out, unless we are able to compress the cord between the finger and the presenting part of the child. And, even when we do feel pulsation, we must be cautious not to mistake the pulsation due to enlarged maternal vessels, which is to be distinguished by the synchronism of the latter with the radial pulse. It is, then, unequivocal fœtal pulsations only which are to be accepted under those circumstances as satisfactory evidence of the displacement which we are now considering. Whatever doubt may exist as to the nature of the case is at once dispelled by the rupture of the membranes, when the loop of the cord escapes into the vagina, or may even pass so far down as to come into sight at the orifice of the vagina. But, should the coil be small, or any other circumstance prevent its prolapse, no difficulty will be met with in perfecting the diagnosis, as the cord may now be felt more distinctly, rolling beneath the finger, and its pulsation may be ascertained by compressing it directly between the fingers; while the fingers and toes, should these parts have given rise to doubt, may, by a similar method of examination, be readily distinguished. There is one possible, though, perhaps, scarcely probable source of error, against which the inexperienced observer must here be on his guard. It occasionally happens that, in extensive rupture of the uterus, a coil of the small intestine passes through the aperture into the uterus, and even into the vagina; and, although the presence of the mesentery and the absence of pulsation should in such cases obviate the possibility of mistake, the sensation which the bowel yields bears such a resemblance to the cord that an opinion might rashly be formed, which might lead, in practice, to the most disastrous results. Several cases, at least, have been recorded in which this blunder has been committed, with the most discreditable and unfortunate issue.

As regards the mother, there is no risk whatever in a presentation of the funis. Experience has, however, shown that, of all possible presentations, not even excepting transverse cases, nothing is more fatal to the life of the fœtus. Of all cases, and without any reference to the fact of assistance being rendered, it is certain that considerably more than one-half of the children are lost, which is sufficient to show that the treatment or management of the cord, in these cases, during labor, is necessarily one of the most important points which can possibly arise in the course of practice. What we desire to effect is the protection of the cord from such pressure as may arrest the circulation, or, in other words, to avert, if it be possible, from the child the danger of death from asphyxia. We have already seen, in reference to presentations of the pelvic extremity, that the chief cause of increased mortality in these cases is pressure on the cord, and the same remark obviously applies with equal force to all cases of transverse or other presentations in which podalic version is practiced. But, unless there should be prolapse, the danger is confined to the later stage of labor, during which the cord is subjected to pressure between the head and the pelvic walls. If the cord presents originally, the vessels are obviously subjected to a more prolonged and continuous pressure, so that the danger is considerably increased. When, in any case, the labor-pains are frequent, violent, and of long duration, the chance of the child's life is small, unless delivery should be effected with unusual rapidity; but if, on the contrary, the pains are moderate, and of short duration, the fœtus has time to rally, during the intervals, from the effects of the partial asphyxia which attends each uterine effort, and the cumulative effect of pressure is in a measure avoided. We must, however, even under the most favorable circumstances, look with serious apprehension, as regards the interests of the child, upon all cases of funis presentation, and we would do well to make a point in all such instances of informing the friends of the patient of the precise danger which we anticipate. Many circumstances, other than those already mentioned, modify the danger of individual cases, but, in all, the continuousness and the degree of the pressure are the points upon which the gravity of each particular instance depends. If it should so happen, therefore, that the cord occupies a position in which it is exposed to comparatively little pressure, the chance of the case is greater; and to this Naegele draws attention, and points out that when the cord presents with the head in the ordinary or first cranial position, the life of the child is much more likely to be spared when it lies towards the left sacro-iliac synchondrosis, the point at which it is least likely to be subjected to injurious pressure.

Treatment.—Unless the case is otherwise abnormal, so as to call for operative interference in the interests of the mother, we of course leave to nature all cases in which we have unequivocal evidence of death of the child. We must, however, be careful in admitting want of pulsation in the cord as satisfactory evidence of the death of the fœtus. If the cord be perfectly flaccid, and is examined continuously, during the occurrence of several successive pains, without any pulsation being discerned, we can have no doubt that all hope of the child must be abandoned. But should the examination have been made hurriedly, during the occurrence of a pain, we may abandon a remediable case while there is yet hope, as it has frequently been observed, in such cases, that pulsation is for a long period arrested during the pain, and returns in each succeeding interval. As a rule, then, we should examine during an interval as well as a pain: and it is only the continuous absence of pulsation which is to be admitted as evidence of death. In almost all other cases, it is proper for the accoucheur to afford some assistance; and in all, without exception, in which we presume that the child is alive, we must watch with constant attention the progress of the labor, so as to afford at the proper moment such aid as may be applicable to the exigencies of the case. The indications of treatment which are to be observed are, either the entire relief of the cord from pressure, or its removal to where it will be subjected to the minimum of compressing force. While there are special cases in which little or no interference is required, or indeed justifiable, these form a very small proportion of the whole. The great majority, therefore, are those in which assistance of some kind or other is essential, and in many of them the skill and perseverance of the operator will be taxed to the utmost. The exact circumstances under which the displacement may occur, are of such infinite variety, that it were endless to attempt to lay down rules which may serve for the guidance of the operator in every case. There is, in point of fact, perhaps no contingency in the practice of midwifery in which sound judgment and self-reliance are so essential; but we are, nevertheless, enabled in the light of the experience of the most distinguished accoucheurs, to lay down certain general principles, upon which the management of presentation and prolapse of the funis is to be based.

Should the cord be felt through membranes as yet unbroken, or through the uterine wall from the vagina, our treatment must be essentially expectant. It must not be imagined that integrity of the membranes is, under all circumstances, a guarantee that the cord is safe from injurious pressure, but so generally is this the case that we are always bound to assume that upon nothing does the issue of the case so much depend as the prolonged retention of the waters. In cases, the termination of which is intrusted to the natural efforts, this is, indeed, of paramount importance; and in all we look upon the danger as imminent only, and not in actual operation, so long as the sac of the membranes prevents the prolapse of the cord. Nothing, therefore, can be more obvious than that we must exercise the greatest possible caution in such manipulations as we may deem necessary, with the view of subjecting the membranes to no such violence as might cause their rupture prematurely. In a word, the preservation of the membranes is, in all cases in which we may be fortunate enough to discover the cord before their rupture, a point of primary importance. For this reason, also, it is far better to leave the presentation in doubt than to run any risk of rupture of the sac in our anxiety to be correct in our diagnosis; and, on the same ground, it stands to reason that no attempt should be made to replace the cord at this particular stage, or even to guide it into those parts of the pelvis at which it will be exposed to least pressure. So long as the waters are retained, we may be confident that the cord is at least under more favorable conditions than could be afforded it by any remedial or operative procedure which we might think proper to adopt. In cases, therefore, in which the bag of the waters occupies the vagina after the termination of what is usually called the first stage, we do not act as we would under ordinary circumstances by rupturing the membranes; but, on the contrary, we look upon the exceptional persistence of the membranes as of good augury in regard to the child in all cases in which we have already recognized the funis. The longer, in fact, the liquor amnii is retained, the shorter will be the final stage during which pressure more or less severe must be encountered; and other things being equal, the less proportionally will be the risk to the life of the child. Persistence of the bag of the waters up to the moment at which the head is being born is perhaps the case of all others in which nature is most likely to secure a happy result. Such cases, however—and along with them may be classed instances in which the capacity of the pelvis is greater than usual—are not frequently met with; but when they do occur we would be quite justified in simply watching the progress of the case, and only interfering when the symptoms become more threatening, or the conditions are such as to render prolonged compression of the cord a matter of certainty.

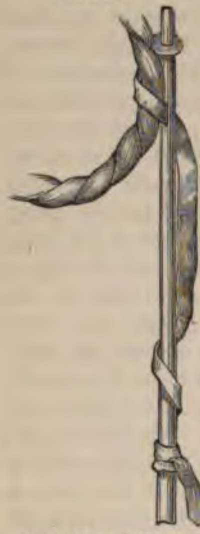
The cases which are of most usual occurrence in practice, and those, too, which are the most favorable in their results, are where the head and the cord present together. In cases in which this complicated presentation has been early recognized, when the membranes are complete and the os as yet but little dilated, it has occasionally been observed that the presenting cord has passed up out of reach, and the head descends alone as in an ordinary case. The possibility of such a satisfactory result would of itself suffice to warrant us in endeavoring, by all means, to preserve the integrity of the membranes, but the result is not, as will be understood, one upon which we can, in any circumstances, depend. It has been asserted upon good authority, however, that the conditions which render such an occurrence most likely, are a small loop of cord which is situated higher than usual and to one side of the os, and when the projecting bag of the membranes is embraced by the lower segment of the womb with unusual force. When the cord descends along with the head, the risk is not so great to the child as in other complicated presentations of which the cord forms an element; for, although the actual compression is greater, it is of much shorter duration than in breech and footling cases, and moreover, the danger ceases the moment respiration is rendered possible by the birth of the child's head. And in addition to this, the possibility of successful reposition of the cord is much greater on account of the more thorough adaptation of the spheroidal head to the cavity through which it has to pass. If, on the other hand, we have to deal with the pelvic extremity, the cord, when replaced, is more likely to prolapse anew, and in every such instance the chance of prolonged compression is much enhanced. No doubt the actual pressure is, in the first instance, less than when it descends along with the head, but we must in such a case look forward, not only to a longer continuance of pressure, but, in addition, to the same ultimate compression from the head, at a period when, from long-continued interruption to the placental circulation, and by the operation of other causes, the life of the child is already in imminent danger.

When that stage is reached at which the dilatation of the os is what we call complete, the membranes being as yet unruptured, it may occasionally be a matter of some difficulty to determine upon what principle we are to proceed in the management of the case. We know that the danger is greater in first than in subsequent pregnancies, and in mature than in premature deliveries; but beyond this we have nothing, in addition to the facts already mentioned, which may guide us, further than a correct appreciation of general principles. If, upon examination, we find that the cord still pulsates, we may perhaps use a little more freedom with the finger, in order to ascertain the probable extent of the coil, and the exact nature of the presentation, but, with this exception, we must generally content ourselves by watching the progress of the case. As the head descends, we should try, if it be possible,—and still acting with the greatest caution,—to guide the cord towards that sacro-iliac synchondrosis which corresponds to the side of the cranium; and in pelvic presentations it will also be proper to act upon the same principle by directing it to that synchondrosis which may correspond to the antero-posterior measurement of the breech, with the view, in each case, of placing the cord at that point of the pelvic circumference at which the pressure will probably be least.

With the rupture of the membranes, the cord will usually prolapse, to an extent proportionate to the size of the coil which precedes or accompanies the presenting part. This is the stage which we will generally select to attempt the Reposition of the cord. With this object in view, we bring the points of the index and middle fingers to bear upon the coil in the interval between the pains, and thus endeavor to push it upwards, beyond the presenting part, into the cavity of the uterus. The process, when the coil is large, will resemble somewhat the procedure applicable to the reduction of a large hernia, by successively replacing portions of the cord until the whole has been reduced, remembering always that, to be effectual, reduction must be complete, and that, if ever so small a portion be left down, pressure may be as fatal as if we had never attempted the operation. But, with the actual reposition of the cord our difficulties do not cease. The reduction of the prolapse may be easy enough, but the real difficulty consists in maintaining it in its new position. The finger must, on this account, not be hurriedly withdrawn; on the contrary, we should, by continuous support, endeavor to retain it within the cavity until the child descends somewhat farther, and forms, by its presenting part, a plug, which renders impossible, from its bulk, the renewed descent of the funis. The finger should, with this object, be cautiously removed during a pain, when the conditions referred to are, of course, present in the highest possible degree, so that, if the operation is successful, the labor will now be completed without any further risk than attends an ordinary case. For the reasons already stated, success will more frequently attend our efforts when the head of the child presents, as this part more thoroughly fulfils the conditions of an effective plug. Unfortunately, however, in a large proportion of cases, this manœuvre will fail, and the cord will descend again and again, under the impulse of the uterine contractions. It was, probably, this unsatisfactory result which induced some noted authorities to recommend a more thorough method of reposition, by carrying the cord upwards towards the fundus of the womb, and endeavoring to suspend it over the limbs of the child, or at least to press it completely beyond the head, into the hollow formed by the neck. Both of these modes of procedure have been repeatedly resorted to, and sometimes with success; but the difficulties which attend the operation in each case are such that, in the greater number of instances, we will fail utterly in our endeavor to maintain the cord in its improved position.

This acknowledged and, in some instances, insuperable difficulty has given rise to much mechanical ingenuity. The object in view is to devise an instrument by means of which the funis may safely be returned to the upper part of the uterus, and, if necessary, retained there. Of such as have hitherto been invented, those which are the most simple in construction seem to have succeeded best. Michaelis recommended that a large-sized gum-elastic male catheter should be used, to the eye of which the prolapsed cord is attached by a ligature, which is to be loosely drawn so as to avoid compression. The stilet is then introduced, and the catheter, carrying with it the cord, is steadily pushed up in the direction of the fundus, where it may be left, the stilet being withdrawn, until the completion of labor. The contrivance of Dr. Roberton is, with a trifling modification, the same as this. A simple piece of flat whalebone has been preferred by some, and is as simple and as convenient as the other. Perhaps if we were to express a preference for one form over another, that used by Dr. Braun for many years in his *Klinik* at Vienna might be selected as combining simplicity and efficiency in the highest degree. It is made of gutta-percha, and is used as is shown in the accompanying figure. It is about sixteen inches in length, and has, about two inches from the rounded extremity, an aperture of sufficient size to allow the passage of a loop of tape or worsted, which, after being carried round the cord, is brought over the extremity of the instrument, and is then pulled so as to grasp the cord firmly without subjecting it to dangerous compression. The apparatus is then pushed as high as is possible in the direction of the fundus uteri, and is allowed to remain until the further descent of the head in the pelvis presents an effectual barrier to the prolapse of the cord. When we are convinced that this stage has been reached, the instrument is to be drawn down with a wriggling or shaking movement, by which the loop passes over the point, and the cord is left behind, while the whole apparatus is removed. Kiwisch effected the same purpose by fixing the point cut from a large catheter upon the extremity of an ordinary uterine sound; and we have tried with success, an instrument made of two parallel pieces of whalebone, of which the one slides upon the other, and has a sort of hook at the end by means of which the cord may be confined or released at will. The principle of the operation is in every case the same, and the varieties above mentioned are but a few of a large number which practical difficulty has suggested to different operators. We cannot, however, depend even upon the best of them for reliable and satisfactory results, and, in fact, we find that many experienced operators prefer the fingers in all ordinary cases; while Tyler Smith informs us that even Michaelis has abandoned his ingenious instrument for the use of the finger. Be this as it may, we should always try, when the fingers fail, what we can do with a *repositorium*, hastily constructed though it may be from such materials as are at hand. The success attained by others is ample warrant for persevering efforts in this direction.

FIG. 127.



Braun's repositorium.

The *Postural Method* of treatment has from time to time attracted attention during the last thirty years, and is associated chiefly with the names of Bloxam, Thomas of New York, and Dyce of Aberdeen. When this plan is adopted, the woman is placed upon her elbows and knees, so as to raise the pelvis above the level of the fundus uteri, and thus to take advantage of the law of gravity. That a certain amount of advantage is thus gained may be admitted, and it would appear that in practice the results have been in a measure satisfactory. We must not, however, anticipate such results as the supporters of this procedure seem to claim for it. The posture in question will doubtless tend so far to the gravitation of the cord towards the fundus, but it must at the same time cause the head to retreat from the lower segment of the uterus, and thus remove what we are accustomed to regard as the most effectual barrier to prolapse, for, when a pain comes on, gravity is a mere feather weight in comparison with the power of uterine contraction. This may possibly explain why it has not been attended with more marked success. We should not hesitate to avail ourselves of the postural method in any case of difficulty, and it is quite possible that by combining the instrumental with the postural method as has been suggested by Dr. Barnes, more favorable results may ensue than have hitherto followed the use of either separately.

So long as vigorous pulsation shows that the life of the child is not in immediate danger,—and this we should also ascertain by auscultation of the fœtal heart,—we must not cease in our efforts to prevent the cord from descending into the pelvis along with the presenting part. McClintock and Hardy recommend that the woman should be made to lie upon the side opposite to that on which the protrusion has taken place. In addition to the means above detailed, the expedients which have been devised are endless. Among these may be mentioned partial plugging of the uterine orifice, after reposition, by a piece of sponge; and the inclosure of the coil of the funis, when unusually large, within a bag of some kind, the whole being then returned to the uterus and left there.

It is universally admitted that a certain number of cases do occur in which reposition of the cord is a practical impossibility, or would be attended with unwarrantable risk to the mother. Of such a nature are those cases—by no means of unfrequent occurrence—in which the accident is not recognized until the head has already descended far into the pelvis. For the management of such conditions no definite rules can be given; all will depend upon the peculiar circumstances of each individual instance. We must be guided mainly by the following general considerations:

1. We must ascertain whether or not the child lives; for it must be obvious that a negative answer to this question bars all further action on our part. When the cord, therefore, is flaccid and pulseless in the interval between the pains, and the pulsation of the fœtal heart cannot be made out, we leave the case absolutely to nature, as we know that there is no danger to the mother, and we need no longer act in the interests of the child.

2. No conceivable circumstances will warrant us in subjecting the mother to any considerable risk. Practically, in an uncomplicated case, she is perfectly safe, so that to endanger her on the mere chance, or even probability, of saving her child, would be worse than absurd. It is, perhaps, true that there is no operative procedure whatever which is not attended with some increase of risk, be it ever so little. But, from a moral as well as a practical point of view, we must draw the distinction between slight and serious risk, and upon this distinction treatment must, in many instances, be based. The principle must, however, remain a general one, for the gradations between the two extremes are infinite, and each case should thus be decided on its own merits, and in full view of the whole facts.

3. When reposition is impossible, the simplest and safest mode of procedure is to guide the cord, as has already been stated, towards that

part of the pelvic wall where it is least likely to be subjected to severe pressure; and of all possible situations, the direction of that sacro-iliac synchondrosis which corresponds to the side of the child's head, if it be a cranial position, is perhaps the most favorable. The pulsations of the fœtal heart, and those of the funis, must now be carefully watched, as representing the condition of the child, and indicating the approach of imminent danger; and upon these observations will chiefly depend our future course of action. So long as the pulsations are tolerably strong, we are justified in leaving the process to nature; and in the case of a woman who has previously borne children, or in whom the pelvis is of larger dimensions than usual, the perilous stage of the labor will often be safely passed, and the child born alive; whereas, in the contrary conditions of a primipara, or a narrow pelvis, the chances of a favorable result are extremely small.

4. When a failure of the circulation is indicated by the stethoscope or the finger, our course of action will be suggested, in a great measure, by the stage at which the labor has arrived. If, in an ordinary cranial position, the os is fully dilated, and the circumstances are otherwise favorable for the operation, we need have no hesitation whatever in applying the forceps, and completing the delivery as rapidly as possible. In the case of the breech, the fillet or blunt hook may be used, with the view of expediting labor; but these, or other operations, are only to be attempted when the conditions are generally favorable, and the risk to the mother is not great.

5. The question of Turning, in funis presentations, demands, as a disputed point in obstetrics, some special attention. In the early part of the present century, the operation seems to have been held in pretty general esteem, but in more recent times the other and safer modes of operative procedure are, when practicable, usually preferred. It must not, however, be supposed that the operation so warmly supported by Mauriceau is to be, under all circumstances, condemned. There are, in the first place, instances in which the operation must be performed in the interest of the mother, no less than in that of the child, and in respect of which, therefore, there can be no hesitation. Of this nature are cases of shoulder presentation and placenta prævia, both of which conditions are apt to be complicated with descent of the cord. Here we scarcely take the cord into consideration, so clear are the other indications; or, if we do, it is only to admit it as of secondary importance, but, at the same time, as an additional circumstance which calls for speedy action, so soon as the proper period shall arrive for the performance of the operation under the most favorable conditions. But, while such cases are clear, it is otherwise when, in a cranial position, the question of turning offers itself for our consideration in the interests of the child alone, other modes of procedure being impracticable. The opinion generally entertained is, that under the circumstances to which we allude, we are rarely warranted in turning,—a view which we believe to be, in the main, correct. That there are exceptional instances, however, in which, after other means have failed, we may be justified in performing the operation in question, we cannot dispute. There is perhaps no one point in regard to presentation of the funis which calls

for more careful consideration and judicious balancing of the special circumstances of individual cases. But it is impossible to lay down rules which might serve, with any approach to accuracy and certainty, as reliable for our guidance. A capacious pelvis, a yielding and moderately dilated os, and other conditions favorable to the operation itself, afford strong presumption that turning may be effected without any great risk to the mother. The period may not have arrived at which the idea of forceps can be entertained, and yet the child is in a state of mmediate peril, so that the question may simply be: Are we to act, or to leave the child to its fate? Here, experience, and the habitual caution which matured experience engenders, can be the only safe guides. We repeat, however, our conviction that cases do occasionally occur in which we would be justified in turning at once. We must not forget, while forming our resolution, that the operation does not necessarily, even under the most favorable circumstances, relieve the child from danger. For, the operation being performed, there is still the critical period of the passage of the head, during which, although everything be done which skill can achieve, the child, already enfeebled, may succumb from the renewed pressure on the cord.

CHAPTER XXII.

PREMATURE EXPULSION OF THE OVUM.

CLASSIFICATION—ABORTION; DIFFERENT PERIODS OF—CAUSES: IN GENERAL HEALTH: FROM REFLEX IRRITATION: FROM DISEASES OF THE FUNIS: FROM ACTION OF OXYTOXICS: FROM AFFECTIONS OF NEIGHBORING ORGANS: FROM MECHANICAL VIOLENCE—TENDENCY TO REPEATED ABORTION—SYMPTOMS; AT VARIOUS PERIODS—PRECURSORY SYMPTOMS: PAINS: HEMORRHAGE—TO BE DISTINGUISHED FROM DELAYED MENSTRUATION—SIGNS OF DEATH OF THE FŒTUS—DISTINCTION TO BE DRAWN BETWEEN "THREATENED" AND "INEVITABLE" ABORTION—RETENTION OF THE OVUM—EXPULSION OF THE PLACENTA—TREATMENT: PREVENTIVE: PREVENTION WHEN ABORTION THREATENED—EXPULSION TO BE PROMOTED WHEN INEVITABLE—MANAGEMENT OF HEMORRHAGE, AND OF THE PLACENTA: PLACENTAL FORCEPS—TREATMENT OF A WOMAN AFTER ABORTION—PREMATURE LABOR—SPECIAL CAUSES—TREATMENT.

ALTHOUGH the usual period of utero-gestation is about ten lunar months, the ovum may be expelled at any time by premature uterine action, the result of the operation of certain causes which we shall have to consider. *Abortion*, in the sense now ordinarily attached to the term, is the name which is applied to the occurrence, when it takes place before the eighth lunar month; while *Premature Labor* occurs during the last three months of gestation. Many writers have confined the term "abortion" to the first sixteen weeks, and apply the word *miscarriage* to the period between that and the twenty-ninth, but it is more convenient to adopt the simpler classification, which has the further advantage of allowing the familiar expressions "non-viable" and "viable" to be used, as applicable to the fœtus, in connection with the periods of abortion and premature labor respectively. Miscarriage is a term familiar to women, and is used by them as synonymous with abortion in the wider sense in which we prefer to use the latter.

Strictly speaking, Abortion may take place at any moment subsequent to conception. Should the one supervene immediately upon the other, or within the first few weeks, no symptom is likely to be manifested which would attract particular attention, and the blighted ovum in such cases might be as difficult of detection as the ovule which is thrown off at a menstrual period. If the ordinary catamenial period, in a woman previously regular, should pass, her suspicions may be aroused; but, if a discharge manifests itself in a few days thereafter, it is assumed that the period has been delayed, and this may be held further to account for the increase in the quantity of the discharge, and of the pain which accompanies it, as compared with the symptoms attendant upon the ordinary menstrual flux. In point of fact, it is rare that the abortions of the first three or four weeks from the assumed date of conception attract such attention as to be brought under the notice of the medical attendant. Even, during the course of the second month, the symptoms, although more distinct, may be overlooked; and the woman who is seized with considerable discharge, and uterine pains of a periodic character in the seventh or eighth week, may be quite unaware that one of the clots which have been expelled contains the immature ovum. To the earliest abortions, the ancients gave the name of Effluxion. When it is said, therefore, that abortion occurs most frequently from the eighth to the twelfth week, we assume that the earlier abortions are not taken into consideration, for in truth we have no means whereby the number of the latter may be even approximately computed.

The liability to abortion is undoubtedly greater in the early months of pregnancy, when the union between the chorion and the decidua is of a lax character, so as to admit readily of hemorrhage into the space between them, with the result of cutting off the temporary communication which exists between the mother and child before the formation of the placenta. Fortunately, however, the earliest and most frequent abortions are not attended with much risk, as the ovum usually escapes entire; and the hemorrhage which accompanies them, and which proceeds from the vessels of the decidua, is rarely such in extent as to cause any great alarm. In the latter part of the abortion period,—the sixth and seventh lunar months,—the symptoms manifested and treatment required are so analogous to what obtains at the full time, that few special directions are necessary for their proper management. It is quite otherwise, however, in regard to abortions which occur in the middle period,—say from the tenth to the eighteenth or nineteenth week. In these cases we have special dangers to dread, and, if possible, to avert, which separate this from any other period of abortion. These dangers are dependent upon special conditions which it is necessary carefully to observe and to understand, and the most important of them is the alteration in the vascular relations between the maternal and fœtal systems, connected with the formation of the placenta.

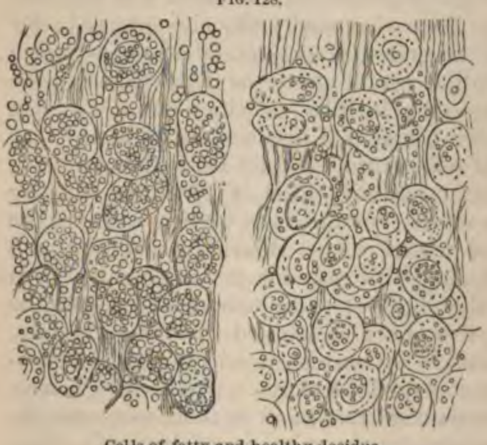
The *Causes* of abortion must, before we go further, engage our attention. These are very numerous, and, being both general and local, may act in a very variable manner in inducing the premature action of the uterine fibres upon which the expulsion depends. Many obvious causes are to be traced to the general health or temperament of the mother. In so far as the familiar affections which so frequently attend early pregnancy are concerned,—such as sickness, faintness, salivation, and the like,—and which, when extreme, are considered among the diseases of pregnancy, it has always been observed that these are very rarely the cause of abortion. The most common of all,—sickness,—is, even in the worst cases, little liable to be followed by premature expulsion. "It is," as Dewees says, "a remark as familiar as it is well-grounded, that *very sick women rarely miscarry;*" and when we see, in some instances, strong and apparently plethoric women miscarry, who have not been sick, we are inclined to share the general impression that sickness is a safeguard, and probably keeps down morbid irritability or rigidity of the uterine fibre. With these exceptions, however, it may be assumed that whatever deteriorates the general health of the mother is apt to produce abortion, or, at least, to place the woman in such a condition that she is more susceptible to the influence of other causes which may then come into play. Any serious disease, whether acute or chronic, may be the direct cause; and the general symptoms which accompany the original disease may be greatly aggravated by the occurrence in question. Many febrile diseases are extremely liable to lead to abortion, more especially small-pox and scarlatina; and in too many of these cases there is a fatal issue. Of chronic diseases, none, perhaps, exercises a more marked influence than syphilis, which actually seems to poison the ovum, and is certainly associated, in many instances, with various forms of disease and degeneration, of which it is the seat. But it is not from the mother alone that such influences proceed; for the ovum may be infected by the poisoned spermatic fluid of the male; and, in some cases stranger still, it would appear as if the woman were a mere conductor of the contagious principle—of which one of the most familiar instances is that which is narrated of his own case by Mauriceau. This distinguished accoucheur tells us that, shortly before he was born, his mother had the misfortune to lose the eldest of her three sons by small-pox, and that in spite of her condition, as women will do, she tended him with constant and tender care. Mauriceau was born the day after his brother's death, and, although his mother, neither then nor subsequently, presented the slightest symptoms of the disease, he had on his body at his birth, five or six undoubted variolous pustules.

Reflex irritation, from a variety of sources, is one of the most frequent causes of premature expulsion of the ovum. The irritation may start from any part of the alimentary canal, and in those instances the nature of the case may be revealed by the existence of dyspepsia, diarrhœa, dysentery, or intestinal worms. In cases of protracted or injudicious nursing, it may have its origin in the nipple, by irritation of the mammary nerves, as was conclusively shown by Dr. Tyler Smith.

But, besides such distal sources of irritation, reflex action may, undoubtedly, be induced by direct irritation of the vagina, as in plugging; or by irritation of the uterus itself, as is effected, in fact, by the contact of a dead or diseased ovum. Illustrations of this variety of case might be indefinitely multiplied. "We may consider," says Tyler Smith, "abortion from reflex action as being, in some points of view, comparable with spasmodic asthma, or any other excito-motor disease. From certain irritating causes, an excitable condition of the excito-motor arcs concerned in parturition is induced. This state of excitability once produced, slight causes, which would, in healthy subjects, produce no disturbance whatever, are sufficient to produce morbid or spasmodic parturition. This excitability is not suddenly reached. It requires that the nervous arcs, whether mammary, rectal, or other, should be irritated for a considerable time, when an excitable, charged, or polar state of the uterine nervous system seems to be produced. The period preceding a case of reflex abortion may be likened to the time preceding an epileptic attack." When the reflex irritation has its origin in the ovaries there is a tendency to the separation of the ovum at what would have been a menstrual period,—a fact which, taking the identity of the decidua and the mucous membrane as a matter of undoubted certainty, seems to confirm the views of those who hold that menstruation involves a periodical discharge of that membrane. This particular cause seems, moreover, to occur, for the most part, in those who have suffered, before impregnation, from some form of dysmenorrhœa.

Abortion is clearly associated in some cases with certain diseases of the ovum. These have already been incidentally referred to in speaking of the diseases to which the embryo is subject. That fatty degeneration of the chorion and placenta has a marked and decided influence, seems at least to have been estsblished beyond doubt in the admirable researches of Dr. Barnes. The particular variety of this degeneration which exercises the most undoubted influence upon the ovum in inducing premature expulsion consists in a metamorphosis of portions of the maternal and fœtal structures of the placenta. This may occur at any period of intra-uterine life, and the appearance presented by the cells of the decidua in the healthy and degenerated placenta are indicated in the figure, where the two are similarly magnified and shown in juxtaposition. It is unnecessary to follow the minute and interesting series of changes which have been traced in reference to this form

FIG. 128.



Cells of fatty and healthy decidua.

of degeneration. It seems, however, to be clearly proved that it is frequently induced by constitutional syphilis. The decidua, placenta, and other parts of the ovum are, like all other vital textures, liable to congestive and inflammatory affections, which may arrest the vitality of the fœtus, either by inducing some of the various forms of degeneration, or by causing sanguineous effusion into the tissue of the placenta, which has occasionally been found to contain purulent deposits. When the blood effused is considerable in quantity, it constitutes what Cruveilhier has described under the name of Apoplexy of the Placenta, which, by interrupting the circulation, may cause death of the fœtus, and, consequently, inevitable abortion, although the fœtus may be retained in utero for a considerable time, while the degenerated structures of the ovum undergo further change. Any of the numerous diseases to which the fœtus is liable may cause its death, and it is believed that twisting or knotting of the cord, either upon itself or round the neck of the child, may have a similar result. Like the placenta, and other tissues of the ovum, the cord too is subject to special diseases, in the course of which its function is destroyed. Besides this, the facts stated by Mauriceau, Stein, and others, seem to prove that the cord when too short may be so dragged upon as to endanger its integrity.

Among the causes of abortion we must not omit to mention those agents to which the name of Oxytoxics has been given. The most familiar of these are the ergot of rye, borax, and savin, which, with some others, exercise an undoubted effect upon the muscular tissue of the uterus. The nature of their action is not thoroughly understood; but it is certain that ergot, and probable that the others exercise a marked influence upon the spinal cord. Through this channel, then, we may infer that the oxytoxic influence passes, which incites the uterus to contraction. The uterus is, however, not nearly so obnoxious to the action of these agents as when the organ is fully distended, either at the end of pregnancy, or from any other cause. A similar action is produced by carbonic acid, as has been abundantly proved by the records of cases of accidental or intentional poisoning. A precisely similar effect follows the retention of carbonic acid in the blood in asphyxia,—a condition under which expulsions of the ovum have very frequently been found to occur. Of the five hundred Arabs who were suffocated in the caves of Dahra, in 1845,—as is said, by the orders of the Duc de Malakoff,—a considerable proportion were women; and of these many who were pregnant were found to have aborted; and other instances of a similar nature have also been recorded. The same fact has been proved experimentally by the researches of Dr. Brown-Séquard, who further believes, as we have already stated, that the oxytoxic action of carbonic acid is the determining cause of labor at the full term, exciting, by the direct contact of venous blood, the irritable uterine fibre to contract. Emotional causes, such as joy, grief, anger, and the like, may produce an effect precisely similar. In some cases of *auto da fé*, and other barbarous acts, in which the victim perished at the stake, abortion has also taken place, partly, as is probable, the result of fear, and partly by the action of asphyxia.

Certain affections of neighboring organs may produce the premature expulsion of the ovum. In many of these cases it would seem as if the cause was a purely mechanical one. Tumors, adhesions which bind down organs that ought naturally to rise with the uterus, and anything, in fact, which may mechanically hinder the development of that organ, may act in the same way. Displacement of the uterus itself may act in the same manner; and we have known cases of uterine retroversion, for example, in which abortion had occurred several times, and in which an ovum only reached maturity, after the displacement upon which the abortion depended had been cured by appropriate treatment.

Premature expulsion of the ovum may also follow the occurrence of accidents or mechanical violence of any kind, such as falls and blows, and these cases are important, as the symptoms which accompany abortion differ in them from the other cases previously detailed. Such causes may act in either of two ways: by an effect produced on the organs or tissues of the mother, or by injury to the fœtus which may cause its death. It has been denied by some authors that the latter is a possible cause, so admirably has nature provided against the effects of accident and shock. We do not speak now, of course, of extreme violence, but of such only as may afterwards operate as a cause of abortion. The following case, given by Cazeaux, is conclusive as to this: "A young woman, six months pregnant, while groping in the dark in her room, struck the abdomen violently against a table. During the night the movements of the child became suddenly very violent, then diminished, and the following day were no longer felt. Two days afterwards she was delivered of a dead child, which presented on the back an ecchymosis as large as the palm of the hand." Burdach gives the case of a woman who, in the sixth month of pregnancy, had received a blow on the lower part of the belly, of sufficient violence to fracture the forearm and the leg. The child was carried to the full time, and the fracture was found at birth to have united at an angle. The effect of such accidents as tell directly on the maternal parts is more obvious. Nothing, however, is more astonishing than the amount of violence which women may suffer with perfect impunity, in so far as pregnancy is concerned. Falls from windows, giving rise to severe contusions and fracture of the limbs, have repeatedly occurred to women who were pregnant, without causing abortion. The late Dr. Pagan used to tell of an instance in which his coachman drove right over a woman who was in the eighth month of pregnancy, inflicting upon her very serious injuries. His master, thinking that premature delivery must of necessity follow, caused frequent inquiries to be made, and found ultimately that the pregnancy was in no way disturbed, and that the woman was delivered of a healthy child at the full time. The slowness with which the uterus responds, in many instances, even to considerable irritation, is familiar to those who have had occasion to induce premature labor; and the fatal result, in cases of criminal abortion, is, no doubt, mainly due to the amount of violence which is resorted to, in the hope of exciting the contractions which milder measures have failed to induce.

A disposition which is exactly the opposite of this exists in some women, who, so to speak, abort upon the slightest provocation. That in many of those cases of habitual abortion there is some anatomical or physiological cause upon which the phenomenon depends, is more than probable; and in all those instances in which there exists a mechanical impediment of any kind, it may follow impregnation periodically, almost as a matter of course. But putting such aside for the moment, there are other, and by no means rare, instances in which we can only account for the repeated abortions by supposing that the uterus has contracted an inveterate habit. It is, perhaps, one of the most familiar observations in obstetrical practice, that a woman who has previously aborted is much more liable to a repetition of the accident than one who has never been pregnant, or who, if previously pregnant, has carried her children to the full term. And when abortion has occurred in several successive pregnancies, we look upon a recurrence of that condition with some apprehension. In such cases it is very generally observed that the tendency to separation of the ovum is greatest at a certain period of pregnancy; and every accoucheur of any experience can recall cases in which successive ova were thrown off at exactly the same age, as calculated from the presumed period of conception. It would thus seem as if, in those cases in which no obvious cause can be detected, there was some perverted condition of the uterine fibre, as regards irritability, which prevented dilatation of the viscus beyond a certain point, analogous to what obtains in morbid irritability of the bladder, when the desire to micturate occurs long before even moderate distension has taken place. And in the latter case, too, habit has something to do with it, and resisting the call has sometimes, at least, a beneficial effect. In the case of the womb, however, voluntary resistance has no effect, and so the act goes on repeating itself if unchecked.

If those above detailed embrace the chief, they are far from representing all the causes which may possibly lead to premature expulsion. This would require a special treatise. Enough has, however, been said to enable us to apply the principles of treatment, which, without a knowledge of the etiology of the subject, we could by no possibility attain.

Symptoms.—These vary somewhat according to the cause and the period of pregnancy. One of the most constant symptoms of all cases is pain, but in some instances the expulsion seems to be accompanied with little pain or even discomfort. In very early abortions,—the "Effluxio" of the ancient writers,—the pain may be no more than that which attends an ordinary menstrual period. The seat of the pain is usually the lumbar, sacral, and hypogastric regions, but it may extend to the groins and down the thighs. A trifling increase in the amount of the catamenial pain, and the presence of some solid masses along with the discharge, may be the only symptoms which attract attention, and are not unnaturally mistaken for those which accompany a delayed menstrual period, when the ordinary functions of the parts are shortly resumed as before. At a more advanced period the symptoms are, as might be expected, more marked. The occurrence is then frequently ushered in by a rigor, followed by an increase of temperature, some increase in the frequency of the pulse, thirst, and sometimes nausea, even when this has not been present before. Other and more vague symptoms, such as palpitation, cold extremities, dimness of vision, and dark rings surrounding the eyes, have also been noticed. A cold uneasy feeling about the pubes, with more or less of weight in the same region, according to the size of the embryo—which may also be experienced in the coxal region—is looked upon, and with justice, as a characteristic and important sign. Lumbar pain and vesical tenesmus are also of frequent occurrence. If they should have been present, there is a cessation of what are recognized as the breeding symptoms; morning sickness is no longer complained of, and the mammae usually become flaccid, although the pain in these glands is sometimes considerably increased.

Those symptoms are in their nature precursory, but are soon succeeded by increase in the lumbar pain, which becomes periodic, and extends to the hypogastric regions. If the fundus can be distinguished behind the pubis, it will now be felt to contract, indicating the commencement of uterine expulsive effort. If a discharge of a hemorrhagic nature has not previously taken place, that symptom will now be observed; the amount of the discharge varying very greatly—depending, no doubt, on the extent to which the ovum has become separated from its attachments. An examination should now be made by the finger; but this must be conducted with great caution, as any roughness of manipulation might make matters worse, by exciting the uterus to more energetic action, or, possibly, by rupturing the thin sac which contains the liquor amnii and the embryo. The os and cervix will be felt to be softened to an extent commensurate with the period at which the pregnancy is presumed to have arrived; and, in addition, the os will be found more or less patent.

In the earlier periods of pregnancy, we may have some little difficulty in making out whether the woman is pregnant or not. In many cases, therefore—in unmarried women, for example—we must be very cautious in expressing an opinion on this point, however suspicious the symptoms may appear to be. According to Madame Lachapelle, the following points are of importance in establishing a distinction between the two. If the case be one of abortion, the os is more or less open; hemorrhage usually precedes the pains, and gives them no relief; but, on the contrary, they become more severe as the case advances. If, on the other hand, the case be one of delayed menstruation, the os is nearly closed, or is at most very slightly opened; the pains precede the hemorrhage, and are diminished upon its occurrence, or may entirely cease when it is thoroughly established. These points are, no doubt, of importance, but are to be received in evidence with caution. Certain other rules are given with the view of enabling us to distinguish between a clot and an ovum in a digital examination at the os uteri, but these are of little if any practical importance, seeing that both a clot and the ovum may, and often do, present simultaneously.

As the case progresses, and the rhythmical uterine contractions continue and increase in energy, the os dilates still further. For reasons which are obvious, the dilatation is often very tedious. At the period of pregnancy at which abortion occurs, the cavity of the cervix is, as will be remembered, little, if at all, invaded by the process of distension to which the cavity of the uterus proper is subjected. Naturally, therefore, its distension by the uterine efforts is effected under circumstances of comparative mechanical disadvantage. The conditions at least are widely different at the termination of the period of gestation, when the circumference of the external os is the only point against which the uterine efforts are directed; and, although the dimensions of the body which is to pass are to be taken into consideration, the wonder is that the difficulty of dilatation is not more universally marked. The rupture of the membranes is somewhat irregular in its occurrence, but if these remain intact, they will often be found to protrude in a manner similar to what obtains in labor at a more advanced period. In the course of the first few weeks, the ovum is generally expelled entire, which, indeed, is a most favorable occurrence, and the cause of the fact that the abortions of that period are comparatively free from danger to the mother. When the membranes rupture, the embryo is expelled, and may be followed at a variable interval by the secundines. Or the latter may be retained for a longer period, to give rise to symptoms and difficulties which will require for their management all the skill and judgment which we may have at our command.

As a general rule, the death of the fœtus precedes the uterine contractions which cause its expulsion. In other cases, again, the fœtus is born in such a condition as would seem to indicate that it had only perished while undergoing the process of expulsion; and, in a third class, chiefly the result of accidents, it is expelled alive, and may move briskly for a few hours after its birth.

It not unfrequently occurs that the symptoms which indicate the death of the fœtus are separated by a considerable interval from those which accompany the expulsive phenomena. When the former, the more important of which have already been detailed, have been distinct and unequivocal, the sequelæ, or external manifestations of abortion, are always to be looked for, usually after an interval of some days. When the woman has received an injury, or has otherwise been subjected to violence, the ovum may, if it be a very early abortion, be expelled almost immediately. If, however, it has attained any size, a certain interval must elapse, when, upon the death of the child, a similar but more gradual result will ensue, the mechanism of the expulsion being essentially the same as in the other cases. It is in the cases in which the cause has been one rapid in its operation that the child is most frequently born alive. Whatever the cause may originally have been, if it acts by first destroying the life of the fœtus, the latter plays the part of a foreign body, and as such, excites the uterus to contract. "The living fœtus," says Rigby, "obeys the laws of organic life; the dead fœtus those of gravity. When once the child has ceased to exist, it acts like any other mass of inanimate matter;" and this too is the reason why the feeling of weight is so frequent, and upon the whole so reliable a symptom in the more advanced periods at which abortion may occur.

The symptoms of abortion call in every case for careful observation and attentive consideration. The most important practical point which may arise is the following: No doubt, we shall suppose, is entertained as to the fact of pregnancy, while the symptoms are clearly those of abortion. But are the symptoms those of threatened abortion only, or do they imply that the loss of the ovum is inevitable? In the former case, we must do all we can to avert the expulsion; in the latter, we do all in our power to promote it; hence the importance, nay, the necessity of recognizing the special symptoms which enable us to distinguish the one class of cases from the other. If we are called to a case of abortion at the onset of the symptoms, we may assume that the loss of the ovum is seldom inevitable unless it is dead. Nothing, therefore, short of clear evidence of the death of the fœtus will warrant you in abandoning all effort to save the child. The danger to the fœtus depends for obvious reasons upon the extent to which separation has taken place between the ovum and the uterus. Whether the ruptured vessels are decidual or placental, the maternal vascular supply for the nutrition and respiration of the fœtus is more or less restricted by the rupture of the connecting vessels. No symptom, therefore, is of greater importance, than the amount of hemorrhage which has occurred, as this may be held to indicate with tolerable certainty the extent of the separation and rupture of the tissues from which the blood flows. The quantity of the discharge is much more important than its duration, so that, whereas in the former case, we despair of the issue, or at least look forward with much apprehension, in the latter we will often meet with instances in which a moderate or trifling amount of discharge may persist for many days without the slightest effect being produced in arrestment of the process of gestation. Profuse hemorrhage, then, recurring at short intervals, and accompanied with pallor, vomiting, and a tendency to syncope, indicates extensive separation of the ovum, and proportionate gravity in the nature of the case.

Uterine contractions may not only be present, but may persist for a considerable time; but we should never on this account alone place the case in the "inevitable" category, as the symptoms sometimes subside spontaneously, and often under appropriate treatment. Rhythmical uterine contraction, however, is always a most alarming sign, and more than sufficient to cause anxiety; but the significance of this as an isolated symptom will chiefly depend on the vigor and continuance of each successive pain. Of greater importance is the condition of the os. If this is agape, with some portion of the ovum already protruding, prevention is out of the question. If even we fail to reach any portion of the ovum, and the os is widely patent, we recognize in that fact evidence which, if not conclusive, is at least presumptive of abortion; while, on the contrary, if the os is but slightly dilated, and the cavity of the cervix has as yet been but little encroached upon, our hopes of a favorable issue are greatly strengthened.

One of the worst indications possible is the discharge of the liquor amnii, and, in fact, when we can be sure that this hȧs taken place, we may abandon all hope of tiding over the emergency. Evidence of rupture of the membranes must, however, be cautiously received. The assertion of the patient on a point such as this may go for nothing.

The observations of an intelligent nurse are, of course, of greater value; but we must be cautious even then, as the possibility of hydrorrhœa and discharges from other sources must be admitted and disposed of before we can speak with confidence. If, with discharge of the waters, we have a gaping os, profuse hemorrhage, and obliteration of the cervix uteri, the case may be given up, and our efforts directed into a new channel, with the view of expediting the process which, under more favorable circumstances, it would have been our duty to oppose. With intact membranes, closed os, trifling hemorrhage, and moderate or irregular uterine contractions, our prognosis may be favorable, but is to be expressed with caution, as graver symptoms may at any moment supervene.

In most cases of abortion, the expulsion of the ovum is slow, and it thus happens that the ovum, or a portion of it, is sometimes delayed for days in the orifice of the os. In so far as danger from hemorrhage is concerned, the death of the fœtus some time prior to its expulsion is an advantage, as the utero-placental vessels atrophy, and there is thus little danger of hemorrhage—less even than in labor at the full time. Or, if the supply of blood be continued as before, it is misapplied, and results in the morbid development of the parts and the formation of a mole. In some cases, again, the death of the ovum is not followed by its expulsion, but it is retained for many weeks, or even months. At a very early period, the delicate tissues of the embryo are dissolved in the liquor amnii, and are said then to form a gummy solution. At a later period, it shrivels or dries up like a little mummy, and may remain unaltered in this condition during the remainder of its sojourn in the womb. In other cases, it assumes the saponaceous and withered appearance, without any putrefactive odor, so graphically described by Devergie, which is apparently analogous to that variety of putrefactive change which the same eminent medical jurist has described under the name of *adipocere*. In these cases, the woman may experience but little uneasiness, or may be perfectly unconscious of anything unusual. She and her attendants may suppose that the ovum had passed undetected, until, after a long interval, a mass escapes from the vagina, with or without pain, an examination of which at once reveals the nature of the case.

Apart from the danger arising from hemorrhage before abortion, the peculiar circumstances which attend the Expulsion of the Placenta are of the highest importance, and differ in many essential particulars from the corresponding phenomena of labor at the full time. "In all cases, the placenta is retained much longer after the expulsion of the child in abortion, than in labor at the full time." Thus wrote Burns, and his assertion is undoubtedly correct; but we must here make a distinction between the different epochs of abortion. In the first and second month, the placenta being undeveloped, the ovum is generally expelled entire, with little risk to the woman. In the course of the fifth and sixth month, the mode of expulsion of the fœtus does not materially differ from what obtains in birth at the full time, except that there is a greater tendency to retention of the placenta and its attendant dangers. It is to the middle term of the abortion period, therefore, that our attention requires more particularly to be directed—say from the eighth to the eighteenth week. During this period, the placenta forms a close anatomical connection with the uterine tissues and vascular apparatus, connections which are often to be severed only with the greatest difficulty. The uterine contractions suffice, in many instances, to burst the ovum and discharge the fœtus, and when the cord breaks or is tied, uterine action ceases. But, instead of a speedy recurrence of the pains, and a natural and unaided expulsion of the placenta, the uterus remains quiescent, the os closes, and the placenta, with the membranes, is retained, sometimes for hours only, but often for a much longer period, extending to eight or ten days, or even more. The absence of pain, and other symptoms of importance, may induce the woman to believe that she is perfectly well, and we may on this account have some difficulty in convincing her of the necessity which exists for perfect rest. A return of the pains, after a very variable interval, marks a renewed attempt on the part of the uterus to rid itself of its contents. If considerable time should have elapsed, the os will have closed so firmly that a tedious process, which is conducted at great mechanical disadvantage, is necessary for its dilatation. This process is often attended with alarming hemorrhage, as it is only now that the utero-placental vessels are being severed, and this hemorrhage may only cease upon the expulsion or extraction of the placental mass.

Should there be no effort at expulsion, the placenta will usually become the seat of putrefactive changes, a condition which will be manifested by the occurrence of a dark and fetid discharge. Under the influence of this, the structures may be broken up and discharged piecemeal; but the process is always tedious, and may be accompanied by low fever, in consequence of which the woman may become considerably reduced, and there is of course the danger of what fortunately does not often occur, viz., blood poisoning through the uterine veins. A similar condition, as regards discharge and general symptoms, may also supervene in those cases in which the membranes rupture, and the fœtus as well as the placenta and membranes are retained, the access of atmospheric air in this as in the former case giving rise to putrefactive decomposition. It is said that, in some cases, absorption of the placenta occurs, and in this way the uterus may get rid of its contents. "In cases of twins," says Burns, "after one child is expelled, either alone or with its secundines, the discharge sometimes stops, and the woman continues pretty well for some hours, or even for a day or two, when a repetition of the process takes place, and, if she has been using any exertion, there is generally a pretty rapid and profuse discharge. This is one reason, amongst many others, for confining women to bed for several days after abortion. The second child may, however, be retained till the full time."

There is one other point which is of great value in estimating the gravity of the symptoms of what is supposed to be retained placenta after abortion. The accoucheur may have had no opportunity before this of personally ascertaining the facts of the case, and may therefore be grievously misled by the details with which he is furnished. Nothing is of greater importance in the earlier abortions than that all clots and solid matters which may escape should be carefully preserved for examination; but, unfortunately, this is seldom done. We may thus be in no small measure perplexed by the doubt whether the imperfectly formed placenta and embryo, or the placenta alone remain behind. The details which are given by the woman or her attendants must therefore be cautiously received, as quite circumstantial details are sometimes given of the expulsion of the embryo, and yet the issue of the case may show that the presumed ovum can have been nothing but a clot, the layers of which may have appeared to resemble the membranes which inclose the product of conception. Important information is almost always to be derived from a careful inspection of the discharges, and all clots should be washed and carefully examined with a view to the discovery of shreds of membrane, fragments of placenta, or structures which show, more unequivocally still, the nature of the case.

Treatment.—The treatment of abortion may be arranged under two heads: 1st, to prevent it when this is possible; and, 2d, to favor expulsion when this is inevitable,—under which we may include the management of the placenta.

The Prevention of abortion may, as a practical question, be presented for our consideration under various forms. In the case of the woman who has aborted on several occasions successively, our treatment is, in the strictest sense, preventive, and must be commenced long before actual symptoms of abortion are manifested. In regard to this particular branch of treatment, while there are certain general principles upon which the management of all cases must be based, there are, at the same time special considerations, which must not be lost sight of, as applicable to individual cases. A careful investigation of the causes which may have induced, on former occasions, the premature expulsion of the ovum, will sometimes point to the special considerations alluded to. There is a great tendency, in those cases of repeated abortion, to the separation of the ovum at the same period of gestation. This law operates with great force in cases in which there is no cause in the constitution of the mother, nor disease in the ovum, to which it can be attributed; so that, in some instances, the uterus actually seems, as it has often been expressed, to have contracted a habit of periodical abortion. The general principles, then, which guide us have their origin in this fact, and the treatment of every case is more or less based upon it. The object is, if it be possible, to tide over the period of former abortions; and, when this can be successfully effected, the pregnancy will often progress, and reach the full time, without the occurrence of a single bad symptom. If we can only succeed in breaking the habit,—be the ultimate result of the pregnancy what it may,—we have achieved something in the way of success; and we have known more than one instance in which the result of treatment was, in the first place, to transfer the period of abortion from the third to the fifth month, and on the occasion of the next pregnancy, a repetition of the same treatment was attended with the most satisfactory results possible.

In effecting our object, in the circumstances now under consideration, rest must be placed first among the remedial agencies in which we may trust. The strictness with which we enjoin rest will depend, in a great measure, on the number of previous abortions, and the extent to which preventive measures have already been adopted. In the worst, or most obstinate cases, nothing will do short of absolute confinement to bed, in the recumbent posture. When the woman has aborted but once or twice, it is by no means necessary that absolute rest should be so strictly enforced; but in every case the chief care is to be directed to the period at which previous accidents occurred. Something will depend on the effect which want of exercise may have on the general health, and if any deterioration should be observed in that direction, it becomes a matter of consideration whether we are not doing more harm than good by the course we are adopting. And moreover, there are many cases in which the circumstances of the patient render it, for her, an impossible matter to abstain from all physical exertion; and there are other cases again in which we have to take into consideration the amount of energy which exists in the temperament of the patient, as it is clear that the woman who leads a life of irrepressible energy will require more restraint than one who is languid and disinclined to exertion. There are other causes which, no less than physical exertion, must be avoided as far as is practicable. Among them are emotional causes, and any local irritation which might, by any possibility, act reflexly in the direction of the uterus. Irritations of the skin, bladder, or alimentary canal, are of this nature, and even such distal irritation as toothache has been known to act in a similar manner. A careful inquiry into the circumstances which attended former abortions should always be made; and if it is found that diarrhœa, vesical irritation, or any similar affection was a prominent symptom, as these often are, it will be proper narrowly to watch, and, if necessary, to rectify, the function which may thus have been disturbed. Separation *a thoro* is in most cases proper, and in some indispensable; and, if necessary, the patient should be cautioned against the effects of tight lacing.

In women who are constitutionally weak, or apparently cachectic, a tonic treatment is, in addition to the precautions just mentioned, held to be proper. Some Spas, chiefly chalybeate, enjoy a certain reputation in such cases, and tepid or cold sea-bathing, both before and after conception, has been strongly recommended by Mr. White, of Manchester. Leeches to the inside of the thighs, or to the perineum, have been employed in cases where the symptoms seem to indicate a condition of uterine plethora. But while the general health of the woman is thus attended to, we must not overlook any special constitutional causes which may be in operation. The most important of these is undoubtedly syphilis, and the best chance of success in dealing with such cases is—whether the mother or father, or both, be affected—to bring them gently under the influence of mercury before coitus is again permitted. An examination of the structures expelled in former abortions may seem to call for certain special means of treatment in addition to the general course of procedure above indicated. Diseases of the placenta or membranes act upon the fœtus mainly by interfering with the oxygenation of the blood. It has been proposed, therefore, that an attempt should be made to introduce a superabundance of oxygen into the maternal blood—an indication which it has been attempted to fulfil by inhalations of oxygen, or by the exhibition of such substances as contain a large proportion of oxygen in a state of feeble combination. It was with this object that Dr. Bower prescribed nitric acid, and Sir James Simpson the chlorate of potash. In the case of other diseases of the ovum or fœtus, such as meningitis or peritonitis, mercury and other drugs have been prescribed on an analogous principle, in the hope of affecting the fœtus through the maternal circulation, but so many difficulties are in the way of correct diagnosis in such cases that little can be hoped for in the way of successful treatment. Indeed, with the single exception of the treatment of syphilis by mercury, we can place but little reliance on the medicinal treatment of habitual abortion, beyond what is administered with the view of giving tone to the system, or allaying constitutional disturbance. We must not, however, even where nature seems to defy us, in any case despair of success. Dr. Young, of Edinburgh, tells in his lectures of a case in which the patient actually miscarried thirteen times, and yet bore a living child the fourteenth time. In the most obstinate cases, a year's marital separation should be enjoined.

The prevention of abortion extends, although in a somewhat different sense, to the treatment of cases in which the symptoms of impending abortion have already manifested themselves. Having taken due cognizance of the symptoms which enable us to decide whether or not the loss of the ovum is inevitable, and being persuaded that there is room for hope, the efforts of the accoucheur will chiefly be directed to the expulsive contractions of the uterus. The success of his treatment will in fact depend upon the power which the remedies he may employ will exercise upon this function of the uterus. Should any source of irritation exist, he must at once attempt to remove or to allay it. Bloodletting was at one time very generally employed in all cases, but is applicable only to those in which there is great arterial excitement, and a tendency to plethora; but in these days few practitioners would risk more than a few leeches to the perineum, and even that under very exceptional circumstances. The most perfect quiet of body and mind is more important perhaps than anything else. The patient should lie on her back on a hard mattress, and be kept cool. She should change her position as seldom as possible, for any exertion, however slight, will often be attended with a gush of blood. Her food should be light and easy of digestion; and not only stimulants, but animal food should in most instances be forbidden to her. Hemorrhage is one of the alarming symptoms which we desire to arrest if it be possible, and on this account it is well to give the food cold, or at least cool. Caution must, however, be exercised in the use of ice, either internally or externally, for if, as is sometimes done, all the food is iced, and, in addition, cold affusion and injection is resorted to, we may excite reflex action of the uterus, and thus defeat our ultimate object, although we may arrest the hemorrhage. With the view of arresting uterine action, nothing can be compared with opium, which is, indeed, our sheet anchor. This has succeeded even in cases where the discharge was alarming, and the os open to a considerable extent. To secure the full advantage of its sedative action, it must be given in full doses, so that forty minims of the Liquor Opii Sedativus in two doses, at an interval of twenty minutes, may be given in most cases without the slightest hesitation. This preparation has, we believe, the advantage which Rigby claimed for it over the other preparations of opium, that its sedative effect is more sure, and that it produces less irritation and derangement of the stomach and bowels. In other cases, again, in which it may be unadvisable to give opium by the mouth, an ordinary enema of starch, with a drachm of laudanum, will be preferred; and in point of fact, the possibility of having a local in addition to a constitutional effect, when it is administered in this way, will probably cause many to make choice of the method. Cazeaux recommends, in addition to this, dry cupping and irritant revulsives to the upper part of the trunk. We must never despair so long as a chance remains of saving the ovum, bearing in mind that evidence of the death of the fœtus is an immediate warrant for suspending all operations which have for their object the retention of the product of conception. It is a safe and good rule, however, that so long as we are not sure that the fœtus is dead, we should act as if it were living.

When violent pains, profuse hemorrhage, discharge of the liquor amnii, and progressive dilatation of the os, show that abortion is inevitable. the treatment differs widely from the above, as the object of it now is to promote instead of to prevent expulsion. In the course of this process, however, there are so many steps to be gone through, that it often requires great nicety and discrimination to conduct a case to a successful issue, which implies the safety and speedy recovery of the mother. In the first three months the less we interfere the better. For, in these instances, as has been seen, the ovum often escapes entire, which is the most favorable occurrence possible; while, if we interfere too much by manipulation in the progress of such a case, we run the risk of rupturing the membranes, discharging the liquor amnii, and thus causing a protracted retention of the whole or part of the ovum. The only symptom which is likely even thus early to call for energetic treatment is hemorrhage. It is unusual at this period for the loss of blood to be a cause of much danger or alarm; but, if it should be so, we should not hesitate to plug the vagina. Of the various modes of plugging the vagina, none is more simple or more effective than that which is recommended by Dr. Dewees. He advises that a piece of soft sponge, of sufficient size to fill the vagina without producing uneasiness, should be wrung out of pretty sharp vinegar, and introduced into the passage up to the os uteri: the blood in filling the cells of the sponge coagulates rapidly, and forms a firm clot, which completely seals up the vagina without producing any of those unpleasant effects which follow upon the insertion of a napkin rolled up for that purpose. There is this to be said in reference to the action of the plug, that while it may be looked upon as universally applicable in all cases of alarming hemorrhage, when all hope of saving the ovum has been abandoned, we should, if possible, avoid it in all other cases. It is an undoubted source of reflex contraction, and may thus precipitate labor in a hopeful case. If properly applied, the plug may be left for a considerable time without interference, and may often be expelled with the ovum. If removed, and the hemorrhage continues while the os is still contracted, there is no course open to us but to renew the plug, and this may always be done with the less hesitation, as it is well known that the risk of internal hemorrhage during the period of abortion is very trifling, and has rarely been observed earlier than the sixth month.

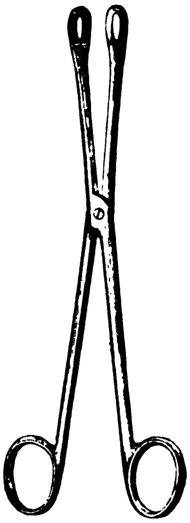
As in the case of other hemorrhages, astringents are frequently given in abortion, and often with good effect. It is, however, in the earlier abortions in which this is most marked, when acetate of lead, gallic acid, and the mineral acids, may often be given with advantage. The more advanced the pregnancy, the less can we rely on ordinary astringents; so that we must then resort to oxytoxics, with the view of exciting uterine contraction of such force as may expel the ovum, or such portion of it as may be retained. A simple enema, or one containing turpentine, will often serve as a powerful incentive to uterine action. If the abortion is one of the sixth month, we may sometimes be justified, when the hemorrhage is alarming, in rupturing the membranes, as in an ordinary case of accidental hemorrhage towards the end of pregnancy—a mode of treatment which was recommended by Puzos. More probably, even then, we would make choice of plugging, in preference to a mode of procedure which must even further remove any small chance of saving the ovum which might exist.

It is the Expulsion of the Placenta, however, in regard to which the greatest difficulty is often incurred. If that period of pregnancy has been reached at which this organ is distinct, the main difficulty would seem to arise from the firm anatomical connection which subsists between the uterus on the one hand, and the placenta on the other. If, therefore, the whole ovum is not expelled entire, as is usual in the early weeks, the effect of the uterine contractions will probably be to rupture the membranes, and discharge the embryo or fœtus through the cervix, which has been sufficiently dilated for this purpose. The action then ceases, the os closes, and the placenta is retained; so that here the analogy between abortion and labor at the full time ceases.

This being the state of matters, we can do nothing but wait. The contracted state of the os prevents the introduction of the finger, and ergot is often of little or no use; so that, unless the hemorrhage is alarming, the safest course is to preserve an expectant attitude. When, after an interval of hours or days, as the case may be, hemorrhage recurs, with pains more or less distinct, indicating further separation of the placenta and renewed uterine effort, we must carefully observe the symptoms which are being developed, and manage the case accordingly. The hemorrhage may be so profuse as to require the plug, while we wait for the dilatation of the os. While this process is slowly being effected, we may find that a portion of the placenta occupies the cervix, and can already be reached with the finger. Great caution should here be exercised; and, if the hemorrhage is not alarming, it may be set down as a rule that we should abstain from interference until there is some clear evidence of entire separation of the placenta, or until the os has reached a stage of more advanced dilatation; and, even then, should all be going on favorably, it will be better to leave the process to nature, than to interfere, with the view merely of accelerating a process which nature is satisfactorily effecting. If we interfere prematurely, we incur the danger of removing from the os a portion only of the placenta, upon which the closure of the os may again occur; and, besides this, the flow of blood may thereby be actually increased, as the portion removed may have served as a natural plug.

When the os is pretty well dilated, or when severe flooding calls for prompt action, the immediate removal of the placenta is of course our first object. With this in view, the finger is to be cautiously passed round the protruding portion, and, if necessary, another finger may be introduced into the os. If we can thus succeed in getting a hold of the placenta upon which we can rely, it may be extracted entire; but a rude or unskilful mode of manipulation may entirely frustrate our efforts by leaving behind a portion of what we wish to extract whole. It is impossible to lay down rules for the skilful performance of this manœuvre, which can only be taught by experience; but we have no doubt that more reliance is to be placed upon the fingers than upon instruments as a general rule. Levret recommended the injection of a pretty powerful stream of warm water, by means of a syringe, into the uterus, on the same principle as is adopted for the removal of wax or foreign bodies from the ear; but the danger of intra-uterine injection, which modern practice has revealed, will probably deter most operators from adopting this plan. The placental forceps was devised by the same authority with the object of grasping and removing a retained placenta. Since then many varieties of this instrument, some of them most ingenious have been constructed. Among others, Dr. Dewees recommended a wire crotchet, which he had used with good effect; and this, variously modified, has been not unfrequently employed since his time. It must be confessed, however, that, whatever ingenuity may be exhibited in the construction of these, the fingers are almost always to be preferred; and, if instruments are tried, they should only be used as auxiliary to the safer means of ordinary manipulation.

FIG. 129.



Placental forceps.

Should such attemps be attended only with failure, we must again plug, with the view of effectually restraining the loss of blood, which soon tells upon the pulse; and the only other resource which remains to us is the use of ergot, or some other oxytoxic agent. Upon ergot, however, we must not depend, for the smaller the bulk of the uterine contents, the less is it to be relied upon; but we are not, on that account, to be deterred from administering it, since it frequently exercises a remarkable influence upon the uterine fibre, even independently of pregnancy,—as we have seen more than once in the case of uterine fibroids, where the physiological effect of the drug was an important element of diagnosis.

Under ordinary circumstances, abortion is attended with but little risk to the mother, and the cases in which her life is placed in jeopardy are, therefore, relatively of rare occurrence. Without taking into consideration the numerous instances in which abortion occurs, and is never recognized as such, this termination of pregnancy is of such frequent occurrence that the difficulties and dangers above described are only too familiar to the busy practitioner. Dr. Whitehead of Manchester made this a point of special investigation, and found that out of two thousand pregnant women, who had applied to the Manchester Lying-in Hospital, the total number of their abortions amounted collectively to one thousand two hundred and twenty-two. Thirty-seven out of every two hundred mothers had aborted before they had reached the age of thirty, and among those of a more advanced age the proportion of abortions was very much higher. It is, in point of fact, a rare thing for a woman to pass the greater part of the childbearing epoch in wedlock, without having aborted once, or oftener,—which, along with the facts above cited, will suffice to show how enormous must be the loss of fœtal life in the aggregate.

The treatment after abortion is a question of considerable importance, but, unfortunately, it is often a difficult matter to persuade a woman of the necessity which exists for the exercise of ordinary prudence and care. Under favorable circumstances, all that may be necessary is confinement to bed for a few days, and avoidance of fatigue and exertion for some time thereafter; but, in other cases, more strict treatment may be necessary. Should retained fragments of placenta give rise again to hemorrhage, the patient must not be permitted to rise until all trace of this has ceased; and, if her general health has materially suffered, a course of chalybeate tonics, change of air, tepid sea-baths, and the like, must be resorted to, with a view of restoring the health. The great danger accruing from neglect of these precautions is not so much to be evinced in immediate effect as in the more remote results; and we are convinced, from long experience, that no more fruitful source of menstrual disorder or of chronic uterine disease exists, than what arises from a want of due precaution at this critical period of a woman's existence.

But little of a special nature remains to be said of Premature Labor, which occurs only during the last three months of gestation,—at a period, therefore, at which the child is held to be "viable." A vulgar idea very generally prevails, that children born at the eighth month are reared with more difficulty than those which are prematurely expelled at the seventh; but careful observation has clearly shown, what reason and analogy would have led us to conclude, that the further removed from the natural term of pregnancy is the period of delivery, the less chance is there of rearing the child. Many of the causes which have been enumerated as inducing abortion may also operate similarly at this more advanced period of pregnancy, but there are undoubtedly other special causes which may also be mentioned. The most important of these latter is overdistension of the womb, from whatever cause this may arise. Plural pregnancy, dropsy of the amnion, and hydrorrhœa, are all causes of this nature; and the immediate result of their operation is that the uterus attains, at a period much earlier than is usual or normal, that degree of distension which is characteristic of completed gestation. The symptoms and treatment of premature labor differ in no essential particular from what obtains at the full term. If the dilatation of the os is somewhat tardy, a commensurate mechanical advantage is gained in the ease with which the fœtus passes through the parturient canal. There is, however, without doubt, a greater tendency to retention of the placenta, although in a much less degree than in the course of the abortion period; and, the nearer the delivery is to the natural term of gestation, the more strictly identical are the symptoms with those of mature birth.

CHAPTER XXIII.

HEMORRHAGE BEFORE DELIVERY.

"UNAVOIDABLE" AND "ACCIDENTAL" HEMORRHAGE—PLACENTA PRÆVIA; CENTRAL AND LATERAL: ORIGINAL IDEA AS TO THE NATURE OF: VIEWS OF RŒDERER AND RIGBY—CAUSES OF PLACENTAL PRESENTATION—SYMPTOMS: HEMORRHAGE BEFORE AND DURING LABOR: EXAMINATION FROM THE VAGINA: OCCASIONAL TERMINATION BY EXPULSION OF THE PLACENTA, WITH CESSATION OF HEMORRHAGE: SYMPTOMS AND TERMINATION OF THE "LATERAL" VARIETY—TREATMENT: GENERAL MEASURES; USE OF THE PLUG OR TAMPON: EVACUATION OF THE LIQUOR AMNII BY PUNCTURE OF THE MEMBRANES OR PLACENTA—TURNING IN PLACENTA PRÆVIA: PASSAGE OF THE HAND THROUGH THE PLACENTA AT ONE TIME PRACTICED: USUAL METHOD OF OPERATION—THE BIPOLAR METHOD—ARTIFICIAL EXTRACTION OF THE PLACENTA: SIMPSON'S STATISTICS—PARTIAL SEPARATION OF THE PLACENTA: BARNES'S VIEWS—GENERAL CONCLUSIONS AS TO TREATMENT—ACCIDENTAL HEMORRHAGE; MORE SERIOUS THAN IS GENERALLY SUPPOSED—SITE OF THE PLACENTA—SYMPTOMS—TREATMENT—USE OF STYPTICS IN BOTH FORMS OF HEMORRHAGE.

WHILE hemorrhage prior to delivery is, as has just been shown, the rule in cases of premature expulsion of the ovum—a rule which indeed, at certain periods of abortion, admits scarcely of an exception—it is otherwise with labor at the full term. With the exception of the trifling hemorrhagic discharge constituting, at the termination of the first stage, what the midwives call a "show," any loss of blood which precedes the birth of the child when mature, is in its nature abnormal. In practice, a certain number of cases are found to occur in which, in consequence of abnormal conditions, a serious loss of blood occurs before birth, so serious as in many instances to imperil the life both of the mother and her child. All cases of hemorrhage before labor do not, however, as will clearly be shown in the sequel, depend on the same cause; and, in consequence, the treatment applicable to each varies in relation to the cause which produces it. Dr. Rigby, in his admirable essay on this subject, published now nearly a hundred years ago, divided cases of hemorrhage which occur in the last three months of gestation into those which are "unavoidable" and those which are "accidental." Of the two, the former is the more important, and is familiarly known under the name of Placenta Prævia; while the accidental form is due to the operation of causes which are similar in their nature, and in their mechanism, to the discharges which occur in abortion.

Placenta Prævia, or Placental Presentation, as it has also with perfect justice been termed, implies that the placenta, instead of occupying its usual site in the neighborhood of the fundus uteri, is the lowest or most dependent part of the uterine contents, and occupies, wholly or partly, the passage through which the child has to pass. When it is attached to the entire circumference of the cervix, it is called "complete" placenta prævia, or Placenta Centralis; while, if it is adherent to a portion only of this area, it is usually designated as "partial" placenta prævia or Placenta Lateralis. Such peculiar situation of the placenta necessarily involves its detachment from the subjacent uterine tissues with which it is in contact. This may take place, either gradually, in proportion as the cervix expands in the latter months of pregnancy, or, more suddenly, when the mechanism of the first stage of labor tears asunder those attachments in the course of the uterine contractions which effect dilatation of the os. In either case, the hemorrhage from gaping vessels is in the strictest sense of the term "unavoidable," as it is impossible for the child to be born without hemorrhage of the most alarming description. There are, on this account, few of the dangers of midwifery which the accoucheur dreads more than this; and Naegele was probably right when he said that "there is no error in nature to be compared with this, for the very action which she uses to bring the child into the world is that by which she destroys both it and the mother."

The idea entertained by the ancients, and which (with the exception of those of Portal and Gifford) was taught in all works on midwifery down to about 1766,—when Rœderer's "Elementa Artis Obstetriciæ" was published—was that in these cases the placenta was originally attached at its usual site, and that it only fell down to the lower part of the uterus after it had been entirely separated. Rœderer, in the work above referred to, gave as complete and succinct a description of placental presentation as is to be found in any modern work on obstetrics, and drew, moreover, a distinction between central and lateral implantation of the placenta. The work of Rigby, published a few years later, but which contains no reference whatever to the observations of Rœderer, is more familiar to English writers, and certainly was the first to bring a correct knowledge of the subject under the notice of English obstetricians, whatever may be the weight of the author's claims to originality.

The *Causes* of placental presentation are but little understood. The fertilized ovum grafts itself, as is well known, generally, upon some portion of the uterine mucous membrane, not far distant from the orifice of the Fallopian tube along which it has descended. It has been presumed that, as the connection between the chorion and the decidua is, prior to the development of the placenta, continuous over the whole surface of the latter, the actual site of the placenta may correspond to any point in the circumference of the ovum. The tumid and convoluted condition of the mucous membrane which obtains during menstruation, and for some days afterwards, is obviously well suited to the arrestment of the fertilized ovum, a body already endowed with independent vitality, and prone to adhere to any surface from which may be derived the *pabulum* on which the maintenance of that vitality must necessarily depend. Exceptional circumstances may, however, occur to permit of the descent and immediate escape of a fertilized ovum; and we may, therefore, infer, that the ovum may, in any such case, be arrested near the cervix, and there go through the series of physiological changes upon which the formation of the embryo depends. The occurrence of extra-uterine pregnancy shows that contact with the membrane, which is specially prepared for its reception, is by no means essential to development of the ovum. There is nothing, therefore, extravagant in the assumption, that it may take root at a point of the uterine mucous membrane distant from the site which it ordinarily selects. Dr. Tyler Smith believes that the impregnation of the ovule may take place as low in the uterus as the cervix; and, if it be so, this will no doubt serve to explain the phenomenon in question. But, even if we suppose for a moment that the ovule has been impregnated before its arrival in the uterus—which is, as is believed, the usual course—there are many special circumstances which may account for its occasional gravitation towards the cervix before contracting adhesions. If, for example, its descent is, relatively to the menstrual period, later than is usual, it may find the mucous membrane no longer tumefied and convoluted to the same extent as before; and there can be no doubt that a smooth and flat surface would be more likely to permit of such gravitation than the other condition of the membrane already referred to as characteristic of a menstrual period. The probable result of such a case would be loss of the ovum; but it is at least possible that it might yet be arrested in its descent, and graft itself upon a surface to which it is accidentally contiguous, as when it falls upon the peritoneum in abdominal pregnancy. All such speculations are, however, merely theoretical; for it must be confessed that, in so far as the etiology of placenta prævia is concerned, nothing definite is known.

In the early months of pregnancy, there are no *Symptoms* which enable us to recognize the condition in question; and, if hemorrhage should take place, it will probably be followed by abortion, in the course of which nothing would occur likely to direct our attention to the peculiar nature of the case. At any period more advanced than that at which abortions generally take place, a sudden attack of hemorrhage, more profuse than usual, and for which no definite cause can be assigned, should always excite our suspicion, as it must necessarily demand our attention. Such hemorrhages, dependent upon placental presentation, usually occur in the course of the last three months of the pregnancy; and the nearer the pregnancy is to its natural termination, the more profuse is the discharge likely to be. If this symptom should be of earlier occurrence than usual, the quantity will probably be slight, and, under favorable circumstances and judicious treatment, will speedily cease. After an uncertain interval, and often at what would have been the next menstrual period, the symptoms will, however, return with increased violence. Repeated hemorrhages of this kind, becoming progressively more alarming, ultimately attract attention, and call for assistance. The loss of blood in these cases probably depends upon the gradual development of the cavity of the cervix, which becomes further encroached upon with every day of advancing pregnancy.

If at this stage we make an examination, we shall probably find that the os and cervix are somewhat peculiar to the touch. This peculiarity consists in a doughy feeling, which is due to the unusual thickness of the cervix, which is necessarily permeated with large vessels for the placental circulation. And this feeling is further exaggerated by the presence of the placenta itself, between the finger and the presenting part, depriving the latter of its feeling of firmness and resistance. If the os is sufficiently dilated to permit the passage of the finger, the characteristic spongy tissue of the placenta may alone be felt; or, if the case should be a lateral and not a central one, we may feel the edge of the placenta projecting at one side of the os uteri, and, possibly, the bag of membranes with the presenting part of the child at the other. If the flooding has been very severe, we may feel the detached surface of the placenta, which is lacerated and stringy to the touch; and we may even discover, in some instances, where the separation has been extensive, a portion of the organ protruding into the os or through it, into the vagina. In presentations of the breech or shoulder, which usually remain high in the pelvis, the detection of placenta prævia is more difficult, partly on this account, and partly because the placenta can less easily be felt than when it is between the finger and the resistant structures of the cranium.

There is another class of cases, in which no symptoms whatever occur until the uterine contractions at the commencement of labor interrupt, for the first time, the continuity of the utero-placental vessels. Here the gush of blood is sometimes so fearful, as to cause immediate syncope, and in some cases the death of the woman before assistance can reach her. Hemorrhage before labor, therefore, has this advantage,—that it enables us to recognize the nature of the case at a period sufficiently early to adopt precautionary measures, with a view to the patient's safety. From the commencement of labor, the symptoms in the two varieties are identical. Each successive pain tends still further to the separation of the placenta from its cervical attachments, and consequently to increase the hemorrhage, so that, up to a certain stage, the more advanced the labor, the more imminent is the danger; and, if left to themselves, such cases almost necessarily prove fatal. It is here that the important practical distinction is drawn which enables us, even without a digital examination, to distinguish between Unavoidable and Accidental hemorrhage, and which led Rigby to adopt this useful classification. In the former, remissions may occur between the pains, but with each contraction the flow of blood is increased; while, in the latter, the descent of the head bars the egress of blood, the source of the discharge being higher in the uterus, as will be shown by and by, when we come to notice this special variety of flooding.

It has been said that hemorrhage before labor is more likely to occur in cases of central than of lateral placenta prævia; and if we were to draw an inference from the anatomical relation of the parts, we would be quite prepared to accept the correctness of this conclusion. Practical experience has, however, shown that we cannot depend on this, and that many cases of central implantation present no symptoms whatever until these are developed by the occurrence of labor. It sometimes, though rarely, happens that the effect of the uterine contractions is to separate the placenta either from its cervical attachments or from its entire uterine connection, so that the hemorrhage is comparatively trifling. In some of these instances, the detached placenta has been propelled into the vagina, and the fœtus then descending so as to press upon the orifices of the gaping vessels, has protected the woman, from that time onwards, from the further effects of alarming hemorrhage. This has suggested a mode of treatment of these cases which will be mentioned at the proper place, and which is not without strenuous advocates at the present day. Another rare termination of central placenta, of which cases have been recorded by Portal and others, is the birth of the child *through* the placenta. A case of this nature occurred in the practice of Mr. White, of Heathfield in Sussex, and is given by Rigby. The placenta was "centrally attached to the os uteri, when, in consequence of two or three powerful pains, the head was forced through, tearing it quite across. The child was born dead, but the mother did well." Such natural terminations of placenta prævia are so rare, that not only do we place no reliance on them, but we do not even allow them to enter into our calculations in determining the mode of procedure which is to be adopted. It has even happened that in these cases children have been born alive; but it is obvious that the life of the child must, almost of necessity, be sacrificed. This is a further reason for not trusting to nature in the circumstances now under consideration.

Somewhat more confidence may, at times, be placed in the efforts of nature, when the case is a partial one, and the placenta situated laterally with respect to the os. As the placenta may be implanted upon any part of the internal surface of the uterus, a considerable variety of cases of partial placenta prævia may present themselves. In those cases in which the placenta spreads over a large portion of the cervix—and it has been observed that it is generally of greater superficial size than when it is developed at the fundus—the same treatment which is held to be applicable to central cases will be indicated. But, in the instances in which the bulk of the placenta is above the cervix, and a small portion only is implanted on that part, it is quite possible that although labor may be ushered in by profuse flooding, the head may be permitted to descend, when it will act as a plug, and the natural powers will effect a safe delivery as regards both mother and child. And, *a fortiori*, when the placenta can only be reached by the finger with some difficulty, this fortunate issue of the case is the more likely to occur; and, in fact, such cases should rather be looked upon as occupying place intermediate between the "unavoidable" and "accidental" category. As is the case with regard to many other of the accidents of midwifery, there seems to be a proclivity to the recurrence of placenta prævia in those who have once been the subject of it; and another and stranger fact has also been noticed by Rigby, Saxtorph, Naegele, and others, viz., that at certain periods this accident seems of more frequent occurrence than at others. The last-named authority, in remarking on this, states "that in some years, placental presentation was so frequent that it seemed as if it were almost epidemic."

Treatment.—The occurrence of hemorrhage in the last months of pregnancy is of itself sufficient to warrant, and indeed demands, an immediate vaginal examination. Should the existence of the symptoms already detailed reveal the presence of the placenta at the os, the future management of the case becomes at once a matter involving no little anxiety. It has already been remarked that the earlier the period of pregnancy at which flooding first takes place, the less is the immediate risk. The treatment of such cases differs but little, as Rigby well remarks, from that of an ordinary case of abortion. The indications, in fact, are the same,—viz., to stop the discharge, and allay any disposition to uterine contraction. At the same time, no effort must be spared to prevent, if it be practicable, any further separation of the placenta.

Nothing is, perhaps, of such importance as rest. The patient should be placed in a bed which is as hard as is compatible with comfort. With the view of keeping her cool, the temperature of the room must be attended to, and the bedclothes should be light. The bowels may be managed by gentle saline laxatives or enemata, and the patient should not be permitted to raise her shoulders; nor, for a certain time after an attack, should she ever be allowed even to move in bed more than is absolutely necessary. The food at first should be of the lightest possible description, such as milk, arrowroot, and the like, and should be given cool. Such restricted regimen cannot be persevered in for any length of time, so that we must soon introduce soups, fish, chicken, and more nourishing material generally, into the dietary. The use of stimulants, except in so far as they may be necessary in the stage of depression, consequent on severe flooding, must be forbidden. Under such treatment, and with the mind as well as the body at perfect rest, the best chance is afforded the woman of reaching the full term of gestation. The probable result of hemorrhage, in placenta prævia prior to the seventh month, is, as has been said, abortion. But, when gestation is further advanced, and the fœtus has reached the period of viability, we endeavor to avert premature delivery as long as is possible, in order to give the child the best possible chance. But we do this in the interest of the mother also, and not exclusively in that of the child. Of the operative remedial measures which may be adopted, none is so frequently resorted to as turning, and the nature of the operation is such that it may always be effected with greater ease to the operator, and less risk to the woman, the nearer the case is to the full term.

When hemorrhage and vaginal examination have revealed the nature of the case, at any time during the last three months of gestation, we should inform the patient and her friends of the certainty of a recurrence of the flooding sooner or later. The number of the attacks, and the period which may elapse between them, are points on which we dare not venture an opinion. In one case, the flow may be almost continuous, or have remissions only; and, in another, there may be but one or two attacks, and these not seldom corresponding to menstrual periods. But the great peril, in every case, lies in this—that we can never foresee the moment when a torrent of blood may be poured out in such abundance, that the life of the woman is placed in instant jeopardy, and may be sacrificed before assistance can reach her. Particular directions should therefore be given, in order that no time be lost in summoning assistance. It is, moreover, of the highest possible importance that a skilful nurse should be in constant attendance, to whom the accoucheur may give instructions as to the method of plugging—the materials for which should be kept prepared and constantly at hand.

The use of the vaginal plug or tampon, as applicable to the treatment of abortion, has already been described. The proceeding in this case is precisely similar, and the material recommended on the authority of Dewees will here suit the purpose equally well. The object of plugging, if practiced before labor has commenced, is simply to prevent the flow of blood, without there being any ulterior object, as regards further operative procedure, in view. This is effected partly by preventing the external flow, and partly by compressing the placenta between the plug and the presenting part of the child, and thus artificially damming up the source from which the blood has escaped. Although, as already remarked, the sponge is to be preferred on various grounds, it, and the coagulated blood which accumulates in its interstices, are so prone to decomposition that it cannot well be retained beyond a few hours. In such cases, then, as it may seem advisable to maintain compression of the placenta for a longer period, it may be better to plug with slips of lint, tow, or some other similar substance; or, better still, by an india-rubber bag, which, after its introduction, may be distended either with water or with air. Braun's *Colpeurynter* is a contrivance of this nature. The plug must not, however, be used rashly in those cases in which the hemorrhage is as yet trifling, and in which, consequently, we are justified in temporizing, in the hope of preserving the child; for experience, derived from the treatment of abortion cases, has clearly shown that the irritation of the plug is pretty sure, sooner or later, to excite uterine contraction. Where labor-pains, however feeble, have already manifested themselves, or where the urgency of the symptoms precludes the hope of conducting the case to maturity, this particular action of the plug is rather an advantage, as, by stimulating the uterine fibre, the os is more rapidly and effectually dilated. Astringents, local and general, have been tried in every possible way in these cases, but it must be confessed that their action is not even in the slightest degree to be depended upon; a result which will not excite wonder if the purely mechanical cause of the hemorrhage be kept in mind.

When the flooding does not occur until labor has declared itself at the termination of pregnancy, or when, at any period, the hemorrhage is so profuse, and the general symptoms so urgent as to demand energetic action in the presence of a great emergency, our duty is to encourage contraction, and to complete delivery as soon as possible. With this object prominently in view, various modes of treatment have been recommended, to each of which it is necessary specially to advert. In a large proportion of the cases in which the os is as yet undilated to any extent, the only justifiable mode of procedure is to arrest the hemorrhage by plugging, and, at the same time, to favor uterine contraction by every means at our command. Plugging is, however, as will be observed, in all cases of placenta prævia, a mere temporary expedient, which is employed with a view to ulterior proceedings.

The evacuation of the liquor amnii by puncture of the membranes is a practice of great antiquity. The object of this in the present instance is to develop uterine energy, which usually becomes increased when its walls are thus relaxed; while, at the same time, being of smaller bulk, it acts with greater energy. The cases to which this mode of procedure seems more particularly applicable, are those instances in which the placenta is situated more or less laterally, or, in other words, those in which the membranes can be reached before the os has become dilated, and without much risk of rupture of tissue. Its use, however, has not been confined to such cases, but has been recommended and practiced by Deventer, Deleurye, Smellie, and, more recently, by others, who, in cases of central implantation, punctured the placenta by a trochar or otherwise, with the result of arresting the hemorrhage. Rupture of the membranes is also applicable to all cases in which it is found expedient to induce premature labor, that is to say, if it can be effected with safety; but, if not, of course other means must be adopted to rouse the uterus to activity. Dr. Barnes says, "The puncture of the membranes is the first thing to be done in all cases of flooding sufficient to cause anxiety before labor. *It is the most generally efficacious remedy, and it can always be applied.*" The italics are his, indicating the emphasis with which he makes the statement, but in so far as our experience enables us to judge, we cannot indorse his assertion. And, moreover, we cannot but think that such a procedure as he describes of guiding a stilet or quill along the finger to the membranes must necessarily cause, for a time at least, an increase in the bleeding in central cases, as it certainly must a complete and violent separation of the placenta in a part of its circumference. The contraction of the uterus may be further promoted by the action of ergot and the other oxytoxics. Evacuation of the liquor amnii and the use of ergot are, it must be remembered, open to this objection, that, by such treatment, the difficulty of the operation of turning is greatly increased, should that operation eventually be found necessary; but, if the operation for separation of the placenta is to be preferred, as is recommended by Dr. Barnes, this objection has no force.

The operation of turning, which will be more particularly described in another chapter, is that to which most modern authorities, with some distinguished exceptions, give the preference in the treatment of cases of placental presentation. So long as this operation is looked forward to as one suitable to an individual case, not only must rupture of the membranes not be practiced, but every means should be adopted which is likely to preserve their integrity. We shall not here anticipate the details of the ordinary operation of turning, but notice only those modifications of the operation which are rendered necessary by the peculiar anatomical conditions of the case. Two methods have been suggested. That to which Dr. Rigby has lent the weight of his authority, consists in forcing the hand *through* the tissues of the placenta into the amnionic cavity, and then completing the operation in the usual way. Dr. Dewees urges the following cogent and unanswerable objections against this procedure:

"1. In attempting this, much time is lost that is highly important to the patient, as the flooding unabatingly, if not increasingly, goes on.

"2. In this attempt, we are obliged to force against the membranes, so as to carry or urge the whole placentary mass towards the fundus of the uterus; by which means the separation of it from the neck is increased, and, consequently, the flooding augmented.

"3. When the hand has even penetrated the cavity of the uterus, the hole which is made by it is no greater than itself, and, consequently, much too small for the fœtus to pass through without a forced enlargement; and this must be done by the child during its passage.

"4. As the hole made by the body of the child is not sufficiently large for the arms and head to pass through at the same time, they will consequently be arrested; and if force be applied to overcome this resistance, it will almost always separate the whole of the placenta from its connection with the uterus.

"5. That, when this is done, it never fails to increase the discharge, besides adding the bulk of the placenta to that of the arms and head of the child.

"6. When the placenta is pierced, we augment the risk of the child; for, in making the opening, we may destroy some of the large umbilical veins, and thus permit the child to die from hemorrhage.

"7. By this method we increase the chance of an atony of the uterus, as the discharge of the liquor amnii is not under due control.

"8. That it is sometimes impossible to penetrate the placenta, especially when its centre answers to the centre of the os uteri; in this instance much time is lost that may be very important to the woman."

These and similar arguments, and the experience of modern practice, have resulted in a general, if not invariable, preference for the second method of performing the initiatory stage of the operation of turning. The origin of the procedure referred to is generally attributed to Portal. The hand, in this case, is to be passed, not through, but by the side of the placenta, choosing, if it be possible to ascertain the fact, that side to which the placental adhesions are least extensive. It is very rare that the attachment is equal in extent all round; and of course, if there is any point of the circumference to which the placenta is not adherent, that place should be selected for the passage of the hand. The usual precautions are to be adopted for preventing rupture of the membranes, and the hand is to be carried high into the uterus between it and the membranes, until the situation of the feet is ascertained, when the fingers are thrust through them, the feet seized, and the operation completed in the usual way. During the course of this procedure—which is often easier of execution than under ordinary circumstances, owing to the relaxed state of the uterus, the result of hemorrhage—the arm of the operator acts as a plug, which effectually restrains external hemorrhage. When the feet are brought down into the vagina, the breech and trunk of the child forcibly compress the placental mass; and in this way one plug is replaced by another more efficient still. The action of the womb should be aided by an external bandage, or by firm pressure, at this period, over the fundus, and a full dose of ergot may be administered, with the view still further of insuring efficient contraction. If the child is still alive, or if there is no evidence of its death (in which case we should act as if it were alive), delivery must be effected as rapidly as is consistent with the safety of the mother. With its birth the critical period of danger will have passed, and the uterus will now contract firmly upon and shortly expel the mass of the placenta which is left behind.

When the accoucheur is summoned at the commencement of labor, on account of the alarming flooding, he will probably find that the os is not sufficiently dilated to permit of the operation of turning with a reasonable prospect of safety. His first duty at this stage is to arrest the hemorrhage, until such time shall arrive as the condition of the parts may warrant him in proceeding to the operation. This can only be effected by the action of the plug, which is to be introduced in the manner above described. Or, what is more effectual still, strips of lint may be introduced, one after the other, through the speculum, as by this means the vagina can be more thoroughly packed. As the pressure of the plug is apt to interfere with the action of the bladder, it will be well to see that that viscus is empty before its introduction. A still more effectual method of plugging may at this stage be practiced by means of the fiddle-shaped water-bags, which we owe to the ingenuity of Dr. Barnes. A certain amount of dilatation is necessary for the successful application of these; but if the os is of sufficient size to admit the point of the finger, it will then be practicable to pass a bag of small size. This may then be distended with water in the manner described by the inventor, and a firm elastic plug is thus formed, which serves the double purpose of preventing any escape of blood, and at the same time of mechanically dilating the os by a safe and graduated method of pressure. The exchange of the small bag for one of larger size may, after an hour or so, be effected without much risk, if the operator is dexterous; and in this way such dilatation of the os may be effected as will admit the passage of the fingers, and subsequently of the hand. But whether we make use of the vaginal or cervical plug, the object is to dilate the os, with the view of subsequent operative procedure.

It is to be remembered that extensive dilatation of the os is by no means essential to the successful performance of the operation of turning. The method of combined external and internal manipulation, which has already been referred to in the chapter on Transverse Presentations, and which will be more particularly described, affords a mode of procedure which is by no means difficult, and which is certainly safer to the mother. To effect this, the passage of one or two fingers through the os is all that is necessary; and, in so far as placenta prævia is concerned, we are convinced that this method is, for other reasons, peculiarly applicable.

"The conditions favorable for turning are," says Dr. Tyler Smith, "a dilated or dilatable state of the os uteri; the retention of the liquor amnii, or a moderately relaxed state of the uterus; a pelvis of average capacity; the absence of dangerous exhaustion, or a temporary cessation of the hemorrhage." Nothing is of greater importance than that the operation should be attempted as early as possible, for there can be no doubt that the great mortality which attends these cases is due, in no small degree, to an injudicious expectant treatment, while the precious moments pass during which alone we can save the patient's life and that of her child. It may sometimes be necessary, when the case does not come under observation until this more advanced and critical stage, to delay the operation, and to plug, until the woman is rallied by free stimulation from the state of incipient collapse into which she has fallen. In this, as in all other cases of prostration from hemorrhage, brandy given along with opium will effect the object in view as well perhaps as any other combination of stimulants which it is possible to prescribe. When, in such cases, the pulse and general appearance show that the woman has rallied, the operation may be commenced, and conducted with the special precautions which the circumstances demand.

In some cases of partial placenta prævia, the operation of turning may not be required; but if in such the hemorrhage is still alarming, after the head has descended so as to occupy a fully distended os, the labor may be completed by the application of the forceps.

Artificial Extraction, and Artificial Separation of the Placenta—for it is proper to draw a distinction between the two—are operations which were suggested by what has occasionally been observed as a natural termination of placenta prævia, viz., the birth of the placenta or its expulsion into the vagina in advance of the child, *with cessation of the hemorrhage.* Imitating this Drs. Wood, Radford, and Simpson, tried what had previously been done in a few cases, to separate and extract the placenta, in the hope of speedily arresting the hemorrhage, and thus insuring the safety of the mother. Simpson, with his usual and indefatigable industry, collated a table, in which cases are given showing the results to the mother in instances of turning. Contrasted with this, is another series of cases, in which the placenta was expelled naturally or removed artificially before the birth of the child. The following represents, in a tabular form, the results of his elaborate statistics:

	Cases.	Maternal Deaths.
Turning, ...	654 . . .	180, or 27.48 per cent.
Extraction or Expulsion, . . .	140 . . .	10, or 7.14 per cent.

Such a result as is represented by these figures is by no means, however, a fair representation of the comparative risk attendant upon the two operations. On the contrary, by grouping together the cases in which natural expulsion had occurred with those in which the removal had been accomplished by operative interference, the value of the comparison is lost, as it must be evident that expulsion is less likely to be attended with a fatal result than those cases in which the parts are torn asunder by an operation which, however gently performed, implies a rupture of tissue by violence, involving the integrity of large vascular trunks. Although the figures are thus quite unreliable, it must be admitted that the cases upon which they are founded show quite clearly that separation of the placenta, whether natural or artificial, is accompanied in a large proportion of cases with an abatement, dependent upon the arrest of hemorrhage, of the more alarming symptoms. "Paradoxical as it may appear," says Simpson, "there are sufficient grounds and facts for believing that, when the placenta is separated slightly and partially, the chance of fatal hemorrhage to the mother is greater than when the disunion of the organs is entire and complete."

It would serve no good purpose to follow the discussion to which Simpson's views as to the source of the hemorrhage in placenta prævia gave rise. These are essentially the same as were held by his predecessor, Dr. Hamilton, that the blood flowed not from the uterine, but from the placental orifices of the ruptured vessels, a point which, although of high physiological interest, must not divert our attention from the more important practical questions upon which it has but little direct bearing. We must not omit to mention that the result of the operation of extraction is, as regards the child, extremely unfavorable in its results—more so, certainly, than turning, if performed at the proper time. In this, also, Simpson's statistics are likely to mislead, if not carefully analyzed. Again grouping together indiscriminately cases of expulsion and extraction, he finds that in 141 cases, the child was saved in 33, and, as the result as regards the child was not stated in a considerable number of the remaining cases, it may be assumed that the actual number of children born alive was somewhat larger than is above stated. But here again the same source of fallacy comes into play, and, in point of fact, it may be assumed that the statistical results of spontaneous expulsion and artificial extraction should be carefully separated, otherwise the figures are very apt to encourage errors in practice. When the fœtus is born by the efforts of nature, it has often been found to be expelled by the same pain which brings the placenta into the world, or at least follows it within a very few minutes, a result extremely improbable in artificial extraction. Dr. Simpson's own tables point conclusively to this fact, and in those cases in which the interval between the birth of the placenta and that of the child was more than ten minutes, he gives but one instance occurring in the practice of Mr. Perfect, in which the child was born alive. Unless then it could be proved that a speedy delivery of the child could be depended upon after extraction of the placenta, that operation cannot be looked upon with favor, in so far at least as the interests of the child are concerned.

But, should we even resolve upon the operation of extraction, the difficulties of the case do not terminate with the completion of that operation. Thus we find that, of the entire number of 86 cases given by Simpson in his tables, delivery was effected by turning in 25 instances, and by other modes of operative procedure in 7, while in 9 the mode of delivery is not specified. This leaves 45 cases only in which the delivery was completed by the natural pains, and we may confidently conclude that, if we could separate the cases of spontaneous expulsion, the issue of the operative cases would appear still more unfavorable. The inference which was drawn from Simpson's elaborate papers on this subject, and the interpretation which indeed seemed to attach to them, was that the author wished to supersede the old operation of turning by that of artificial separation. We might think it necessary to say something more in refutation of such a conclusion, were it not that the practice has never commanded general support, save under exceptional circumstances. And, moreover, a careful reperusal of Simpson's facts, arguments, and conclusions, seems very clearly to show that, whatever opinions may have been entertained by that distinguished accoucheur when he submitted his views to the Medico-Chirurgical Society of Edinburgh in 1844, those were materially altered before his death. This appears even more clearly from the "Lecture Notes," by which the reprint of his selected obstetrical works recently edited by Dr. J. Watt Black is prefaced.

We shall now refer to the mode of partial separation which has of late years received a considerable amount of support. It is intimately associated with the name of Dr. Barnes, whose writings on the subject of placenta prævia are among the most valuable of the many contributions to obstetrical literature which we owe to the distinguished obstetric physician of St. Thomas's Hospital. The effect of the uterine contractions, and consequent dilatation of the os is, as he has shown, to separate the placenta in concentric rings from below upwards, vessel after vessel being thus opened, and the hemorrhage proportionally increased. So soon as the separation has reached a certain height, the passage of the head may become possible, while yet a sufficient amount of placenta may remain attached. Dr. Barnes maintains that the complete separation of the placenta as recommended by Simpson is impracticable. "In by far the greater number of cases," he says, "the placenta extends higher than the meridian of the uterus, often reaching the fundus. The fingers are not long enough to reach even half way towards the further margin of the placenta. The diameter of the placenta is nine or ten inches; the fingers will barely reach three inches. In the greater number of cases, therefore, in which the directions prescribed have been followed, the placenta has not been wholly detached, and the result, when successful, cannot be attributed to an operation which was not performed." Assuming this fact to be correct, and supposing, therefore, that to insure *complete* separation of the placenta, the whole hand must be passed into the uterus, he adds that this operation "is even more severe than turning, which does not require the hand to be passed through the cervix." Here he obviously refers to the bipolar method. There is, he infers, a zone or line around the lower part of the uterine cavity, *above* which spontaneous detachment and hemorrhage do not occur, and *below* which alone separation and unavoidable hemorrhage take place.

On this hypothesis, then, the real period of danger is that during which the placenta is being separated from the cervical zone, and Dr. Barnes maintains with great confidence that this is the mode of action in many of the cases which have been narrated of spontaneous cessation of the flooding, the real facts being misinterpreted by the observer. In a case which recently occurred in the experience of the writer, the facts observed seemed strongly to corroborate the idea thus suggested, in regard to which he had previously been more than skeptical. A young woman, pregnant for the second time, had had several attacks of hemorrhage prior to the expiry of her pregnancy. With the first labor pains another gush took place, and shortly after this she was first seen and examined by him. He found the os sufficiently dilated to admit a single finger, and the placenta completely surrounding the orifice. During several successive pains it was observed that the quantity of blood was for such a case very trifling, and it was on that account resolved to leave the case for a time to nature, with the view of observing what course nature would adopt. Materials were prepared for plugging the moment this should seem to be necessary, and the case was anxiously watched. Soon afterwards pains came on of great violence, and in rapid succession, but there was only one short period of about a minute and a half, during which the hemorrhage was alarming, which suddenly ceased upon the rupture of the membranes. Upon an examination the head was now felt descending, and the woman was shortly afterwards safely delivered of a living child. She made an excellent recovery.

Whatever may be the method of treatment upon which it is resolved to act, the first difficulty generally is to be effect the dilatation of the cervix with the least possible chance of hemorrhage. Dr. Barnes, believing that the tardy separation of the placenta from what he terms the "orificial zone" of the uterus is the main cause of hemorrhage, recommends that, if rupture of the membranes, which is his first procedure, should fail, we ought at once to separate the whole of that part of the placenta which is adherent to the zone in question. The details which he gives are as follows: "Pass one or two fingers as far as they will go through the os uteri, the hand being passed into the vagina if necessary; feeling the placenta, insinuate the finger between it and the uterine wall; sweep the finger round in a circle, so as to separate the placenta as far as the finger can reach; if you feel the edge of the placenta where the membranes begin, tear open the membranes freely, especially if these have not been previously ruptured; ascertain if you can what is the presentation of the child before withdrawing your hand. Commonly some amount of retraction of the cervix takes place after this operation, and *often the hemorrhage ceases*. . . . If uterine action return so as to drive down the head, it is pretty certain there will be no more hemorrhage; you may leave nature to expand the cervix, and to complete the delivery. The labor, freed from the placental complication, has become natural." Failing this, he then advocates the use of his hydrostatic dilators, which at once dilate the os, and arrest the bleeding. These bags, which we have had occasion repeatedly to use, and which we have ventured to suggest as applicable to the plugging and dilating of the os prior to turning, admirably serve the purpose of dilatation. After an hour or half an hour, the bag may be withdrawn, and if then the uterus remains inactive, with a continuance of the hemorrhage, or if the presentation turns out to be transverse, or otherwise abnormal, which is very common in placenta prævia, the operation of turning is then to be resorted to by the bipolar method. On a total of 69 cases treated by Dr. Barnes on this principle, the percentage of maternal death was only 16.66.

The various methods above described may be conveniently epitomized for practical purposes in the following propositions, in which it is attempted to give its proper value to each:

1. That the Evacuation of the Liquor Amnii is specially applicable to cases of lateral or partial placenta prævia, and other cases in which the membranes can be easily reached; and to cases in which the fœtus is immature.

2. That Ergot and other Oxytoxics may be administered, but it is to be remembered that both these and evacuation of the liquor amnii act so as to render the operation of turning more difficult.

3. That Plugging is called for at various stages, and may be applied either in the vagina or in the os uteri. It is a mere temporary expedient, and, in the case of turning, is an almost essential mode of preliminary treatment.

4. That Extraction of the placenta, although not so impracticable as Dr. Barnes supposes, is not to be resorted to unless the circumstances be very exceptional, as when the operation of turning is impossible, and that of separation has failed.

5. That Separation of the placenta, which has sometimes been confounded with extraction, is a much more justifiable procedure than the latter. It may be performed in all cases in which the condition of the parts or the state of the mother prohibit turning; but the evidence in its favor is not as yet sufficiently clear to warrant us in abandoning the older operation of turning. That it arrests hemorrhage in a considerable proportion of cases is admitted, but until a more extended experience shall corroborate the conclusions of Dr. Barnes, it would be unwise to admit them as proved. Statistics in such a case are of little value, and this Dr. Barnes himself frankly admits.

6. That the operation of Turning is that in which the great majority of experienced practitioners still place the greatest confidence. If the percentage of maternal deaths under this treatment is, as Simpson says, as high as 27.48, including all cases indiscriminately, we are certainly bound to conclude that in those instances in which the patient is under treatment from the first, the results will be very much more favorable. If the plug bars the hemorrhage, as it generally does when properly applied and carefully watched, that stage of the process must be admitted as effectual. But it is not to be forgotten that the operation of turning is one which involves special risks, of which laceration of the os and cervix, terminating in uterine phlebitis, is not the least, and that, therefore, we must weigh well the responsibilities we undergo before we reject all other modes of procedure in favor of this operation

as it is usually performed. The risk, however, has been greatly modified by the introduction of the bipolar method of version.

The so-called *Accidental Hemorrhage* differs in many essential particulars from the unavoidable variety commonly called placenta prævia. The designation is, of course, more an arbitrary than a philosophical one; but as it is one generally intelligible to English readers, we shall not attempt to change it. In this case, also, there is hemorrhage before delivery, but there is a most important clinical distinction to be drawn between the two. In the last three months of pregnancy the anatomical connection which subsists between the uterus and the placenta becomes more feeble, so that the one is more easily separated from the other. The wonder then is, not that the separation does in rare instances occur, but that it does not occur more frequently. In accidental hemorrhage, the placenta is attached to the uterus at its normal site.

What the Causes are which, in such circumstances, lead to a separation of the placenta are but little known or understood, but it has been observed that the separation rarely occurs in the young and robust; while, in those who have borne many children, or in whom any cause may have led to constitutional feebleness, it is relatively of more frequent occurrence. If, in such cases, the flooding is to be looked upon as a symptom of constitutional depravity, that of itself renders the case a grave one; but another source of hidden danger is that the hemorrhage is often concealed. Placental separation indeed occurs; blood is insinuated between the membranes and the uterus; obvious shock and even collapse is produced; and yet no single drop of blood escapes externally, while laceration of the uterine wall has occurred from the over-distension of the cavity by a hemorrhage such as this. In other cases, again, the placenta has remained adherent at its margin, while an enormous quantity of blood has been effused between the uterine wall and the body of the placenta. It would appear that, in many cases, the separation of the placenta takes place in the centre and not at the margin, and that the blood makes its way towards the margin, and thence frequently beneath the membranes, until it makes its appearance externally. These are the cases which, although by no means so treacherous or so dangerous as the former, are generally described as accidental hemorrhage. In some of them, the general symptoms are as severe as those which accompany a case of placenta prævia, and in others are much more grave than the actual external flow would seem to account for. Sickness, pallor, dimness of vision, and fatal prostration may thus rapidly supervene in a case of this nature before even the symptom of flooding has attracted any particular attention.

Accidental hemorrhage may occur either before or during labor. The great diagnostic feature which, according to all authorities, from Rigby downwards, enables us to distinguish, during labor, between this form and unavoidable hemorrhage, is that, in the latter the effect of a pain is to increase the flooding, by still further separating the placenta; in the accidental form of hemorrhage, the presenting part descends during a pain, and thus, by plugging the cervix, stops the external hemorrhage.

Many writers seem to pass over these cases, as if they were of little importance, and were as nothing beside the more interesting physiological speculations which arise from a consideration of placenta prævia. In point of fact, however, they are extremely fatal to the child, and highly dangerous to the mother, so that their management involves, in some instances, no less anxiety than placenta prævia itself. In so far as Treatment is concerned, the first step in accidental hæmorrhage is, undoubtedly, to rupture the membranes, so as to give egress to the liquor amnii. This, by removing the strain on the uterine walls from within, has a well-known tendency to promote vigorous expulsive action on the part of that organ. This is the most efficient safeguard which it is possible to procure, for it not only plugs the os, by forcing down the fœtus, but, what is more important, it compresses the placenta between the uterus and the child, and, by the same action, mechanically closes the mouths of the vessels from which the blood has flowed. Friction, ergot, and if there be much depression, stimulants may also be used, with the object of encouraging uterine action in those cases in which it is feeble or absent. But these means may fail to excite efficient uterine action, and the expulsion of the uterine contents, upon which alone we can depend for the safety of the mother. Should this be the case, our next step, after indulging, in the absence of actual hemorrhage, in a reasonable amount of expectancy, should be to dilate the cervix gradually, by means of Barnes's bags, and to complete delivery by the operation of turning, in which the bipolar method should always, if it be practicable, be preferred. The previous evacuation of the liquor amnii will, no doubt, render the manœuvre of turning more difficult than it would otherwise have been; but, on the other hand, as it is failure of uterine action which calls for the latter operation, the atony of the uterine walls will generally compensate for the absence of those conditions which are usually held to be favorable to the performance of the operation of turning. The greatest possible care should, in every case, be taken to avoid precipitation in the course of the manipulation, and thus to preserve the integrity of the tissues of the cervix.

The peril of the woman does not necessarily terminate, either in unavoidable or accidental hemorrhage, with the birth of the child, or even with the expulsion or extraction of the placenta. The uterine fibres may remain in such a paralyzed condition that flooding may still go on from the patent orifices of the uterine vessels. In such an emergency it may, therefore, be necessary to apply some powerful styptic to the bleeding surface, with the view of arresting the post-partum hemorrhage, an object which, in the case of placenta prævia, may be most effectually attained by swabbing the cervical zone with perchloride of iron, alum iron, or a peeled lemon; but, in the case of the accidental variety, it may be necessary, in order to reach the bleeding surface, cautiously to inject the cavity of the uterus with the same powerful agents.

CHAPTER XXIV.

HEMORRHAGE AFTER DELIVERY.

HEMORRHAGE IN THE THIRD STAGE OF LABOR—ABNORMAL AND RETAINED PLACENTA, AND IRREGULAR UTERINE CONTRACTION, AS CAUSES OF FLOODING—POST-PARTUM HEMORRHAGE—CAUSES; GENERAL AND LOCAL—SYMPTOMS; OF EXTERNAL AND INTERNAL HEMORRHAGE: EXAMINATION OF THE ABDOMINAL WALLS: EXAMINATION BY THE VAGINA: GENERAL SYMPTOMS: SYMPTOMS WHICH INDICATE THE APPROACH OF DEATH—TREATMENT; PREVENTION: TREATMENT DURING THE HEMORRHAGE; PRESSURE AND FRICTION OVER THE UTERINE REGION—EFFECTS OF BANDAGING—EFFECT OF PASSING THE HAND INTO THE UTERINE CAVITY—APPLICATION OF COLD, SHOULD NOT BE CONTINUOUS—ASTRINGENTS TO INTERNAL SURFACE—GALVANISM—ERGOT—TREATMENT BY PLUGGING ABANDONED—VIEWS IN REGARD TO COMPRESSION OF THE ABDOMINAL AORTA—APPLICATION OF THE PERCHLORIDE OF IRON AND OTHER STYPTICS: OBJECTIONS TO, AND ARGUMENTS IN FAVOR OF THIS PROCEDURE—DR. BARNES'S PROCESS—TREATMENT DIRECTED TO THE GENERAL CONDITION OF THE PATIENT—EFFECTS OF REST AND POSITION—REACTION TO BE AVOIDED AFTER SEVERE FLOODING—TRANSFUSION: THE "MEDIATE" AND "IMMEDIATE" PROCESSES: DR. AVELING'S APPARATUS: INJECTION OF DEFIBRINATED BLOOD, AND OF SALINE SOLUTIONS.

ALTHOUGH hemorrhages which precede the expulsion of the placenta, are not, properly speaking, *post-partum*, we shall, for convenience' sake, consider them here. The proper management of the placenta, with the object mainly of preventing hemorrhage, has already been explained in the chapter on the Management of Labor; but there are some other important matters which are still left for consideration, and as some of these have strong analogies with true post-partum hemorrhage, it has been thought better to include them in this section of our subject. Retention of the placenta, and consequent hemorrhage, may be the result of mismanagement; but, independently of this, there are other causes, over which we have little or no control. If the circumstances attending the labor are in all respects normal, the placenta is probably separated entirely, either during the birth of the child, or in the course of the *dolores cruenti* which follow it. In a certain number of instances, however, the placenta is not separated in this manner; owing, in one class of cases, to some anatomical peculiarity in the form of the placenta, in a second to atony, in a third to irregular contraction of the organ, and in a fourth to what has been described as morbid adhesion.

Cases of abnormal placenta, in which the organ is divided, or has detached cotyledons, are of such rare occurrence that no practical importance can be supposed to attach to them. A full account of these is given, with beautiful illustrations, in a recent work by Hyrtl.[1]

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[1] Die Blutgefässe der menschlichen Nachgeburt. Wien. 1870.

Should atony of the uterus be the cause, we must attempt without delay to excite uterine contraction by frictions, cold applications, or ergot. In such a case, we have a double cause of hemorrhage in operation,—an absence of the contractile force upon which the closure of the bleeding vessels depends, and a mechanical hindrance to that contraction in the presence of the placenta. Of irregular contractions of the uterus, that which is most frequently spoken of is "hour-glass" contraction, in which a spasmodic stricture of certain fibres of the uterus divides the organ into two cavities, within the upper of which the placenta is imprisoned. True placental adhesion depends, again, on actual disease of the decidua or placenta, or, at least, on the presence of morbid products which are the result of antecedent disease.

In all these cases, the treatment is the same, and consists in the speedy removal of the placental mass or masses. If there is a loss of expulsive force, the hand is to be passed, with the usual precautions, into the uterine cavity, so as to grasp the whole placenta. A pause should, however, be made here until contraction takes place, which is to be further aided by the pressure of the hand on the walls of the abdomen, so that, if possible, the placenta and the hand may be expelled together. If this is not done, the placenta may indeed be extracted, but, in such a case, flooding of the true post-partum variety can hardly fail to take place from the flaccid organ. If the so-called hour-glass contraction—which has often been observed to occur at the site of the internal os—should be found to exist, the efforts of the operator must, in the first place, be directed to the stricture which has to be overcome before the extraction of the placenta can be safely effected. There is no doubt, however, that hour-glass contraction is of much less frequent occurrence than is generally supposed. It is a familiar expression, and is apt to be employed loosely, as representing all forms of irregular uterine contraction in which the extraction of the placenta is a matter of difficulty. When the uterus contracts irregularly, this materially affects the process of separation of the placenta, besides mechanically hindering its extraction. The gradual insinuation of the hand into the womb, and the introduction of one or two fingers into the contracted portion, so as gradually, by gentle but sustained efforts, to overcome the morbid spasm, or other condition, which is indirectly the cause of the hemorrhage, is the treatment which is applicable to such a case. It requires no great force to wear out a spasm of this nature, and although at first it may be almost tetanic in its rigidity, it will gradually yield, and, by permitting the passage of the hand, admit of the easy removal of the placenta. When the cause of hemorrhage is the adhesion of a partially separated placenta, it is sometimes necessary to introduce the hand, and forcibly strip the organ from its uterine attachments. This peeling process, which must be conducted very slowly and steadily, will often occupy a considerable time; but, fortunately, the cases in which the operation is required are of rare occurrence. It would appear that, in some of these instances at least, the uterine tissue, with which the placenta is in such intimate connection, is morbidly soft and friable, so that the operator runs the double risk of leaving behind adherent portions of a placenta, the bulk of which has been removed, and of injuring the uterine walls, which are no longer, in their structure, such as to admit of even ordinary force. Do what we may, portions of placenta are sometimes left behind, which may require to be removed as the causes of subsequent hemorrhage, or which may afterwards be spontaneously discharged,—a result which may, although very unjustly, be set down to the discredit of the accoucheur. Such retained masses have been removed, when unusually adherent, by the wire-rope écraseur.

In so far as the ordinary and normal condition of the placenta is concerned, the best safeguard against the hemorrhage in question is the proper management of the placenta during, and subsequent to, the birth of the child. This has already been described in another section of this work.

True *Post-partum* hemorrhage is an alarming and sometimes, in its effects, an appalling occurrence. When, in the course of labor, everything has passed as favorably as could be desired, the child is born alive, and the mother is apparently well, we naturally anticipate, as experience has taught us, a happy issue to the case. But the termination of labor, the real hour of trial to the mother, may be the beginning for her of a new and unforeseen peril. One of the essential physiological phenomena of labor is, as has been shown, the efficient contraction of the uterus during and after the birth of the child. This is nature's all but invariable safeguard. At times, unhappily, the uterine fibres which close the bloodvessels are relaxed, and blood pours forth with an impetuosity proportionate to the calibre and relaxation of the vessels, deluging the woman with blood, and reducing her in extreme cases to a condition of collapse which may be the immediate forerunner of death. So fearful is the torrent, in the worst cases, that, before we even have time to arrange our plan of treatment, our patient lies dead before us. The more experience one has of the practice of midwifery, the more do we dread the occurrence of this form of hemorrhage, which we can seldom foresee, and which is therefore all the more appalling, since we have seen no occasion to nerve ourselves and to prepare for an approaching emergency.

Causes.—A certain number of cases are, no doubt, due to slovenly practice, a neglect of those details which should be matter of routine in every case. But while such causes may generally be avoided by ordinary skill and attention, there are other instances where the causes upon which the flooding depends are comparatively little, and sometimes not at all, within our control. One of the most important and, at the same time, most common causes of post-partum hemorrhage is uterine inertia. It may be that in these cases the uterine effort is simply exhausted, and complete atony is the immediate sequel of labor. Anything which may have tended to reduce the vital powers may lead to this. In women who have long suffered from wasting diseases, whose constitution may have been exhausted by many rapidly succeeding pregnancies, or in whom the vital energies have been in a measure sapped by a long-continued or complicated labor, we see illustrations of those conditions, which are predisposing causes of hemorrhage after labor. No small proportion of the fatal cases seem to have occurred in women who were the subjects of the more advanced stage of Bright's disease, or of any similar disease which exercises a deteriorating influence on the composition of the blood, increasing the watery at the expense of the corpuscular elements. It has been observed that, when the labor is unusually rapid, either from violent expulsive effort or deficient resistance, there is a tendency to post-partum flooding. It would appear, therefore, that a condition of safety is gradual emptying of the uterine cavity. In this way the fibres have time to contract to the enormous extent which is essential to the effectual closure of the vessels; whereas, sudden contraction, although possibly efficient enough as regards delivery, cannot maintain itself, and is often followed by subsequent intermittent periods of relaxation, during which flooding is almost sure to occur. This, no doubt, is the reason why, after delivery by the forceps, and in some other obstetrical operations, flooding is more frequently observed—an excellent and sufficient warrant for the strict observance of the obstetric aphorism that we should empty the womb in operative cases as slowly as possible, and allow it to contract upon the child as it is being expelled. Sometimes, however, anxiety for the life of the child and other circumstances may lead us, for what may seem good reasons, to disregard this maxim; but in doing so we should always admit into our calculations the fact that, in avoiding one danger, our pilotage may cause us to make shipwreck on another somewhat more remote.

Fibroid growths connected with the uterus, and especially fibroid polypi are, if present, almost certain causes of hemorrhage after labor. It is well known that hemorrhage is one of the earliest and most constant symptoms of this affection in the unimpregnated state, and it is not therefore to be wondered at that the proclivity to flooding should be more marked at the critical period which immediately succeeds delivery. This symptom may be caused in two ways,—either by hemorrhage from the mucous surface of the tumor, or by the mechanical interference which it exercises in preventing the proper closure of the venous orifices in the wall of the uterus.

Another affection may here be mentioned as an undoubted cause, and which, although it has not the slightest pathological affinity with the tumor just described, may be, and has by very experienced observers been, mistaken for it. We allude to inversion of the uterus. The symptoms of this, which will be more fully noticed in another place, are indeed such as, under ordinary circumstances, could scarcely be mistaken. In the one, we have a tumor generally ovoid in shape, connected with a pedicle which we can trace up to the os or beyond it to its intra-uterine attachment; in the other, we have also an ovoid tumor, but which ends abruptly by a more extensive attachment, within easy reach of the finger. In the former case, we find the distal extremity of the tumor encircled by a ring, formed by the os uteri more or less contracted; in the latter, there is no such constriction. But this, be it remembered, applies only to the diagnosis of *complete* uterine inversion, which must pass, slowly or more rapidly, through various stages before it becomes complete, and at any one of these it may be arrested. In other words, there may be partial as well as complete inversion, and it is the former condition only which is likely to be mistaken for a polypus.

In a case which, many years ago, came under our notice, there was a rounded tumor narrowing towards its upper part and tightly embraced by the os, and it was this condition which led to an erroneous diagnosis. In a precisely similar case, one of the best known and most distinguished accoucheurs in Britain made a similar error, but fortunately discovered his mistake, just as he was about to remove the tumor by the écraseur, by the pain which the patient complained of, and which he knew by experience was a most unusual symptom in manipulating polypi. Let us beware, therefore, of mistaking a partially inverted uterus for a polypus which is protruding from the uterine cavity.

The *Symptoms* of post-partum hemorrhage are flooding, or the general symptoms to which it gives rise, or both of these combined. In by far the greater number of instances, the external discharge is at first, and throughout the whole course of the case, the most alarming, as it is the most palpable sign. It may immediately succeed the birth of the child, or may precede or follow the expulsion of the placenta. The quantity of the discharge is very variable, and upon this will depend, in a great measure, the opinion which we may form as to the gravity of the case. Generally, symptoms, more or less distinct, of uterine inertia will be manifested. The firm tumor which we are accustomed to feel behind the pubis loses its distinct outline, and becomes less perceptible to the touch; or may disappear altogether, so that we can perceive nothing but softness and flaccidity. We may then feel parts, such as the projection of the last lumbar vertebra and the promontory of the sacrum, which we know to be separated from the fingers by the tissues of the womb. If the inertia or atony of the uterus is complete, this condition is persistent, and on introducing the hand into the cavity, which may generally be effected with ease, we find that the uterine walls are soft throughout, and, as Cazeaux graphically describes it, "folded together like a piece of old linen." Such a condition, should it precede the separation of the placenta, may exist without hemorrhage; but, if the third stage of labor has been completed, flooding is inevitable. In many of these cases, however, it will be to the observer a matter of wonder that the hemorrhage should not be more profuse. Sometimes there are efforts on the part of nature to effect uterine contraction, when the hand, in the hypogastric region, may detect alternate relaxation and contraction of the organ, the latter periods being accompanied with the expulsion of such blood as may have accumulated within the cavity during the former. This disposition to rhythmical action on the part of the uterus is not to be looked upon with unnecessary apprehension, unless the actual flow of blood, or the general symptoms, are grave. Indeed, we are inclined to believe that it is so far a favorable symptom.

The absence of alarming external hemorrhage is a negative symptom, which may divert the attention of the inexperienced from the true nature of the case. In some of these cases, bleeding may be going on internally to an extent which may rapidly place the woman in a position of extreme peril. The continuous absence of the uterine tumor, and the formation, subsequently, of an extensive and soft abdominal swelling, progressively increasing in size, will, along with the general symptoms which rapidly develop themselves, soon indicate what is going on. The conditions under which such symptoms may manifest themselves, are, first, a state of the uterus which admits of easy dilatation; and, second, anything which mechanically impedes the external flow. Any displacement of the flaccid womb which may close the external orifice mechanically, may be sufficient, in the first instance at least, to check the flow in the direction of the vagina. Subsequently, the occlusion of the orifice with a clot, which will form a more effective plug, if the os and cervix should be in any degree contracted; and, at an earlier period, the pressure of the wholly or partially detached placenta may in this way form a barrier which, under ordinary circumstances, would speedily be swept away, but which, in the utterly flaccid and dilatable condition of the uterus, may be sufficient for the development of the phenomena in question. Sometimes this process of distension is accompanied with great agony, which is not the result of attempted contraction of the organ, but of the morbid phenomenon of over-distension, an indication which is not unfrequently noticed in distension of the other hollow viscera. If the hand of the operator is now introduced into the cavity of the womb, he will recognize still more clearly the condition of matters, and he will find his fingers entangled in an enormous mass of clots, with which, and with fluid blood, the cavity is distended to an extent which may equal the size of the organ at the natural period of mature gestation.

The general symptoms which indicate post-partum hemorrhage may exhibit themselves equally in external and internal hemorrhage. They are, unfortunately, familiar to all experienced practitioners; but, as symptomatic of the accidents we are now considering, they are, for obvious reasons, of greater importance in those instances in which the hemorrhage is internal. In the worst cases, the symptoms are truly appalling, and in the course of a very few minutes the loss of blood may be so enormous as to plunge the woman, almost without warning, into a state of fatal syncope. In cases which, though less desperate, are scarcely less alarming, the woman may, with or without previous abdominal pain, and with or without external hemorrhage, experience a feeling of faintness associated with marked pallor. The vision becomes dim, and she calls out that she can no longer see; vomiting frequently occurs; and the extremities and general surface of the body become cold and bedewed with a clammy perspiration. The pulse becomes rapid, small, or imperceptible; and the paleness becomes so marked, so greatly exceeding all others, that Dr. Tyler Smith has called it "Puerperal Pallor." In some cases, however, the effect on the circulation is such as to produce, in the first instance, what is familiar to surgeons as the "hemorrhagic pulse," a symptom which is apt to mislead the inexperienced. This is a bounding and *apparently* full pulse; but, if its character be more carefully tested, it is found to be remarkably compressible, and soon, with a continuance of the flooding, merges into the more familiar condition of feebleness and imperceptibility.

Such symptoms are manifestly indicative of a state of extreme peril, and, if prompt and skilful treatment be not speedily afforded, are too often the precursors of death, which may be preceded by dilatation of the pupil, hysterical paroxysms, or even by convulsions. It has frequently been observed that the amount of blood lost is not a safe criterion of the danger; for, not only are we apt to be deceived in regard to the amount of internal hemorrhage, but there is the greatest possible variety in the symptoms which, in different women, attend a loss of a precisely similar amount; and it may be added that it is not invariably the strong and robust who bear hemorrhage best or recover most rapidly from its effects. In those cases in which hemorrhage after labor is due to a laceration more or less extensive of the os, or of any other portion of the parturient canal, the symptoms are rarely such as to excite alarm. The dangers to which such occurrences give rise are of a different nature, and do not manifest themselves till a later stage.

Treatment.—There are, perhaps, few practical questions involving more anxious consideration than this. The young practitioner may have, in the first case of midwifery which he is summoned to attend, an illustration of this accident. He has no time for reference to books, no moment even during which he may appeal to his memory for facts which have escaped it; and he must, therefore, be fully prepared by a thorough acquaintance with the subject, or he is unable to cope with so great an emergency. The principles on which all treatment depends, demand, then, his careful attention.

It is perhaps scarcely possible to attach too great importance to the prevention of post-partum hemorrhage. Much will depend upon a proper management of the various stages of labor, retarding the action when this has a tendency to be precipitate, promoting it when the pains are feeble, and acting otherwise as has been recommended in the chapter on the management of labor. The importance of never leaving a woman until you are satisfied with the uterine contraction after delivery will, in view of the circumstances above stated, now become more manifest. We can never be sure of the case unless we are satisfied on this point. There are certain points here, however, which if not understood, might result in the *nimia diligentia* of the tyro. First, it must ever be borne in mind that each case of labor is accompanied in its last stage with a certain amount of hemorrhage, and this is not unfrequently considerable, without being accompanied, either then or subsequently, with any other symptoms which should excite alarm. A second circumstance which may cause needless alarm is the gush of liquor amnii, mixed or colored with blood, which immediately follows the birth; and a third consists in what we very frequently observe, a certain amount of alternate contraction and relaxation which may seem to resemble, in some degree, the conditions above described. An erroneous inference, drawn from these observations, we have known to lead to treatment which was energetic enough certainly, but which was quite unnecessary, and, moreover, not unattended with risk. Caution must, therefore, be exercised, lest, by giving undue prominence to one symptom without reference to the others, needless panic and improper interference is the result.

There are cases in which the history of previous labors, no less than the circumstances attendant on that which is going on, indicate, at least, the probability of a similar result, and in such it is always proper, towards the end of the second stage, or at least before the extraction of the placenta, to administer ergot with the object of insuring efficient contraction; and the same agent may be used in all cases in which, after the expulsion of the placenta, there is a tendency to atony. Moreover, we would do wrong, knowing what we do of the effect produced upon the uterus by excitation of the nipples, were we to omit to have the child placed early to the breast. These means, along with the application of the abdominal bandage, and the other details which have previously been fully described, constitute what is called preventive treatment.

The course of procedure, to be adopted in actual presence of the emergency, is the real question which may task our knowledge, our nerve, and our ingenuity to the utmost. The object which, before all others, we have in view, is to promote uterine contraction, and if we fail in this, we fail utterly. Of the various methods which we have at command, that which is invariably first employed is manual pressure exercised upon the fundus of the uterus, and also upon its lateral walls, by attempting to grasp the whole organ. In doing this we do not so much depend upon the effect of such mere mechanical compression as upon the more indirect action whereby the uterus is excited to contract, a result which is further encouraged by circular friction exercised over the fundus of the organ. The effect of the abdominal bandage at this moment certainly is to aid contractile effort, by affording a substitute for the support which has been lost by the inevitable relaxation of the abdominal walls. The bandage is, however, no advantage, but the contrary, when it prevents us from ascertaining and, when necessary, continually watching the condition of the uterus and its relation to the abdominal walls. It is best to have it loosely attached, so as to admit of easy removal and reapplication, and by placing one or more folded towels over the hypogastric region, the compression of the uterus is kept up continuously, and is not temporary or intermittent, as that of the hand necessarily must be. Should this not be immediately followed by satisfactory uterine contraction, the hand should be passed into the vagina, so as to ascertain the condition of the uterus more exactly. Sometimes the irritation of the cervix which is thus caused results, with the aid of the external hand, in the action so much desired; but should the organ remain in a state of complete atony, the hand is to be passed into the cavity, in order still further to stimulate it to contraction by contact with its internal surface.

The reflex effect of cold in producing uterine action is often well marked. This may be applied either to the abdominal or thoracic walls, to the vulva, or by injection to the rectum or vagina. It has often been observed, even in cases in which the action of this powerful agent was at first marked, that its *continuous* action is not to be depended on. However effectual, therefore, it may seem in the first instance, when applied suddenly by the douche or otherwise, the action should not be sustained; otherwise an effect the reverse of beneficial is apt to be produced. The injection of the uterine cavity with iced water, or the application to the inner uterine surface of a piece of solid ice is, under circumstances of emergency, quite justifiable, and has often proved efficacious. The alternated action of heat and cold has been found more useful than sustained cold, the latter agent acting in two ways as an astringent and an excitor of uterine action. M. Evrat recommended the use of a peeled lemon, which he introduced into the cavity of the uterus and then squeezed, so as to project the acid juice upon the bleeding surface. A sponge wrung out of vinegar, and other astringents have, in the same way and for the same purpose, been introduced, and the effect of such applications has not unfrequently been to rouse the uterus from its dormant condition. Galvanism has also been employed with good effect, and may always, if immediately available, be tried. In all cases in which the cavity of the womb is occupied with clots, these should be removed, as they often seem, by presenting a mechanical impediment to feeble contraction, to encourage a continuance of the flooding. As in the case of artificial extraction of the placenta, it is well to allow the hand and the clots to be simultaneously expelled by uterine action, should it be possible to arouse the organ to such an effort.

In the worst cases, little dependence can be placed in the use of ergot, for before sufficient time may have elapsed to admit of the physiological action of the drug, the patient may be dead. It may often, however, be tried, and if so, is to be given in full doses, and at as short intervals as is possible. The stomach will, however, often reject it, as indeed, when the patient is in a state of extreme collapse, it will reject anything solid or fluid which may be swallowed. This is not at any time to be looked upon as in itself an altogether unfavorable occurrence, as it has often been observed that violent retching has been attended with uterine action, so much so indeed that some practitioners have actually prescribed ipecacuanha with the view of obtaining its emetic effect. Plugging as a method of treatment in these cases is of ancient origin, and has been advocated in modern times by Leroux and others who adopted his opinions. This method of treatment has, however, proved inefficacious, and has been abandoned. The mode of action must obviously have been, whether the plug was applied in the vagina or within the womb, to convert external into internal hemorrhage, and in no sense, therefore, to benefit the patient. The last attempts of this nature which have been made would seem to have consisted in the introduction within the uterus of Gariel's air pessary, which was then distended in the hope of compressing the bleeding vessels, an effect which a more correct knowledge of the condition of the uterus will not permit us to count upon.

The flaccid condition of the abdominal walls which immediately succeeds delivery, enables us, without any difficulty, to press upon, and more or less effectually arrest the flow of blood through the aorta. In desperate cases, therefore, the compression of this great vessel has been practiced, in order to arrest the torrent which continues to pour from the uterine vessels; but the practice has by some been violently opposed on theoretical grounds. Baudelocque maintained continuous pressure upon the aorta for several hours at a time, and imagined that in this way time was gained at least, during which ergot and other agen might act, and the strength of the woman might be restored. T most weighty objection to the practice is obvious, in the fact that t source of the hemorrhage is not so much in the curling arteries as the venous sinuses, so that aortic compression cannot be supposed exercise a very decided effect. But there is, moreover, another objecti which has been urged, viz., that it is scarcely possible to compress t aorta, without at the same time subjecting the vena cava to more less pressure, so that directions have been given whereby the pressure to be directed to the left side of the vertebræ, in order to avoid the ven cava. Cazeaux believes that the result of such compression of the vena cava should be looked upon as rather a favorable condition than otherwise; and we are certainly inclined to agree with him in thinking, that in the most alarming cases, the volume of blood can only be accounted for by supposing that it proceeds, by regurgitation, from the great venous trunks. Two methods of compression of the aorta have been recommended: in the one, the vessel is compressed through the abdominal walls, and in the other, the hand is passed into the uterus, and the vessel closed, as is assumed, more effectually, by pressure through the posterior uterine wall. While it must be confessed that the results of this procedure have not been such as to encourage us to look upon it with anything like confidence, there still seems to be in it a ray of hope, to which, when all else may have failed us, we cannot close our eyes. By all means, therefore, let aortic compression be tried. There is certainly no evidence upon which we can rely, that the practice has ever been productive of harm, while many believe that it, at least, arrests temporarily the rapid downward tendency which is so characteristic of a considerable proportion of such cases.

The application, not of astringents merely, but of powerful Styptics, to the inner surface of the uterus, is a mode of treatment which has, during the last few years, attracted considerable attention in this country. The procedure is not a new one, and even as regards the styptic salts of iron, which are, undoubtedly, the best, they were originally used by D'Outrepont, and also by Kiwisch, who, upwards of twenty-five years ago, strongly supported this method of treatment. The action of such powerful agents is looked upon by most practitioners with considerable apprehension, and that it is so is not, perhaps, to be wondered at. Nothing, indeed, would be more unjustifiable than such a procedure, unless, in the first instance, other means have been tried, and have failed to arrest the flow of blood. In the presence of a great danger and instant peril, the objections to the application of styptics have less force. We do not wish in any way to undervalue these objections; but even admitting their validity, and viewing the operation in the light of a desperate remedy, the facts which are given by Kiwisch, and recently, in this country, by Dr. Barnes, are such as to afford us much encouragement, and may warrant us, under certain conditions, in availing ourselves of this method of treatment.

It is proper to notice here the dangers which may arise from the injection of perchloride of iron: these have been very fairly put by Dr. Barnes, who is the great supporter, in this country, of the procedure.

The perchloride produces immediate coagulation of any blood with which it may be brought in contact, but the danger to be dreaded is, that such coagulation might extend further, and should coagula be carried to the centre of circulation, death would be the probable, if not the inevitable, result. Immediate death has followed the injection of even a few minims into a nævus, and in one such case which is quoted by Dr. Barnes, "examination showed that the point of the syringe had penetrated the transverse facial vein, and that the blood in the right cavity of the heart had been immediately coagulated." Several cases have occurred on the Continent, and at least one in England, in which an injection of the perchloride has resulted in death by peritonitis, caused by the passage of a portion of the injection through the Fallopian tube. It is not to be forgotten that a similar result has followed the injection of fluids which are comparatively innocuous, but the possibility of such a result must, under no circumstances, be lost sight of. Forcible injection of the uterine cavity should never be attempted. Were it possible thoroughly to sponge the inner surface of the uterus in an efficient manner, this, no doubt would be preferable; but, as it would be all but impossible thus to bring the styptic solution into actual contact with the bleeding surface, some other means must be adopted. We are ignorant, it must be remembered, of the extent, or even the exact site of the surface from which the blood flows; and, moreover, the cavity is so occupied with fluid and clotted blood, that we could not hope, by any mere process of sponging the actual surface of the mucous membrane, effectually to reach it. It would be necessary therefore, as a preliminary measure, to wash out the uterus. Dr. Barnes says, however, that the conditions inseparable from a recent delivery, are a relaxed and patent condition of the os, which would readily admit of an escape into the vagina of any fluid injected in excess, so that the conditions are, in all respects, different from what has obtained in most of the fatal instances recorded, where injection has been practiced in an unimpregnated, and sometimes in a displaced, uterus.

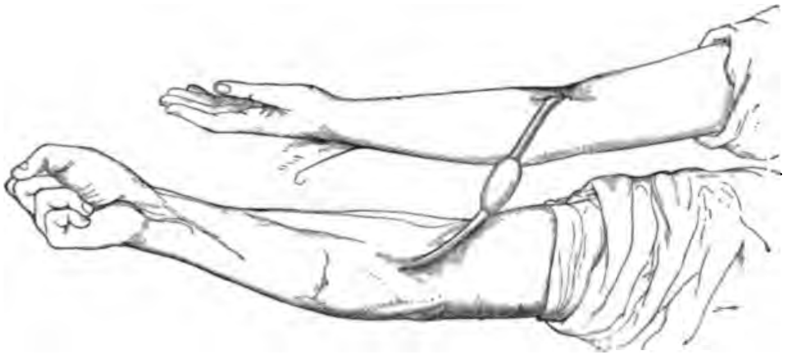
The following is the course recommended by Dr. Barnes: "You have the Higginson's Syringe adapted with a uterine tube eight or nine inches long. Into a deep basin or shallow jug, pour a mixture of four ounces of the Liquor Ferri Perchloridi Fortior of the British Pharmacopœia, and twelve ounces of water. The suction-tube of the syringe should reach to the bottom of the vessel. Pump through the delivery-tube two or three times to expel air, and insure the filling of the apparatus with the fluid before passing the uterine tube into the uterus. This, guided by the fingers of the left hand in the os uteri, should be passed quite up to the fundus. Then inject slowly and steadily. You will find the fluid come back into the vagina mixed with coagula, caused by the styptic action of the fluid. The hæmostatic effect of the iron is produced in three ways: first, there is its direct action in coagulating the blood in the mouths of the vessels; secondly, it acts as a powerful astringent on the inner membrane of the uterus, strongly corrugating the surface, and thus constringing the mouths of the vessels; thirdly, it often provokes some amount of contractile action of the muscular wall." All facts hitherto recorded seem to show that we have in this an almost certain means of arresting uterine hemorrhage, and Dr. Barnes insists that we should not defer its application too long, but resort to it without hesitation so soon as the ordinary means have received a fair trial. To wait until the vital powers are all but exhausted is certainly not giving the measure fair play; but we apprehend we would only be justified in having recourse to such a procedure after the inefficacy of the other means has been thoroughly proved.

In the course of any treatment which may be adopted, the general condition of the patient must of course receive earnest and continuous attention. The tendency to syncope must be combated by free stimulation by brandy, or by brandy and opium in combination, upon which, we confess, we place even more reliance. The frequently repeated objection to opium in such cases is, that it is an agent which arrests uterine action, and therefore should be avoided when our object is exactly the contrary of this. And the objection holds good in so far as very large doses of opium are concerned; but if the dose be a moderate one, and combined with brandy or some other stimulant, it will always be found, if it acts at all, to act in a beneficial manner by rallying the patient from collapse, and either thus indirectly, or, it may be, by a more direct action, exciting the uterus to contract. The patient should always be placed upon her back with the pelvis high and the head low. The object of this is, not only to take advantage as far as is possible of the law of gravity as a hæmostatic, but also to prevent that lateral bagging which is apt to take place in a relaxed uterus in the ordinary obstetrical position. Perfect rest and the recumbent posture are essential, not only at the time of the hemorrhage, but for a considerable period thereafter. All danger does not cease with the arrestment of hemorrhage, or even with uterine contraction; so that all these measures must be insisted upon as safeguards against the recurrence of the peril with which the patient has been menaced. If it be a rule never to leave a patient, even after natural labor, without satisfying ourselves of the state of the uterus, how much more important must it be to watch the case in which hemorrhage has already caused us anxiety, and in which there is always a tendency to its return. Flooding may, in some instances, only become alarming when some time has elapsed after delivery; but, in most of them it will be found to be due to the retention within the womb of a portion of the placenta or membranes, or of clots which have prevented the thorough closure of the cavity.

The tendency to syncope should, in all cases, be combated as far as is in our power; nor, in a condition of great depression, should the patient be permitted to yield to the drowsiness which overtakes her, as this may prove as fatal as that which is the result of exposure to intense cold. The period of convalescence after severe hemorrhage is one which may require great care and management. There is, above all, a tendency to reaction, which may manifest itself in the form of præcordial oppression, severe headache, and throbbing of the carotids, which injudicious treatment, either by alcoholic stimuli or improper articles of diet, may increase to symptoms more serious still. The bulk of the blood which has been removed must be replaced gradually, and with caution; and although the tolerance of stimulants is, during the hemorrhage and in presence of the symptoms of collapse, sometimes truly marvellous, when brandy seems to produce no more effect on the brain than as much pure water, it is quite otherwise when the immediate danger has passed and the patient begins to rally. When the symptoms which indicate reaction subside, it may be necessary to persevere, by means of generous diet, old wine, and tonics, for many weeks, or even months, before the system recovers from the fearful state of depression into which it has been thrown.

There are cases in which the arrest of hemorrhage, although complete, seems to have come too late, the recuperative forces of nature having been too seriously compromised. There remains in these cases a state of utter prostration in which there seems to be no tendency to rally, an irritable stomach, a continued tendency to syncope, and an apparent arrestment even of the function of assimilation. Such a state of matters can only terminate in one way, unless we can induce a rally, and the feeble hold which the patient has on life is gradually, but too surely relaxed. These are the cases in which, however desperate the circumstances, the operation of transfusion has succeeded, and may again, as we hope, succeed in rescuing the woman from the very jaws of death. This operation may be performed in various ways. The simplest process is that of *immediate* transfusion by some such simple apparatus as has been recommended by Dr. Aveling.[1] This is described as consisting "of two small silver tubes to enter the vessels, and of an india-rubber tube by which they are united, and which has in its centre an elastic receptacle, holding about two drachms. It is without valves, and is simply a continuous pipe with an expanded portion in the middle. By its means, the vessels are, as it were, extended from one to the other, and a supplementary heart is added to regulate the circulation." Air is got rid of by first pumping water or a saline solution through it,

FIG. 130.



Dr. Aveling's apparatus for transfusion.

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[1] Obstetrical Transactions, vol. vi, p. 133. 1865.

aveling's appar [illegible]
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and then seeing that it is quite full of blood before the tube is inserted into the recipient vein.

In what has been called, in contradistinction from the other, the *mediate* process, the blood is first received in a vessel, in which it is kept at the proper temperature, and it is thence injected by means of a syringe, different varieties of which have been devised by Drs. Little, Richardson, and Graily Hewitt. In addition to the difficulty which attends the exclusion of air, another and no less formidable one consists in the tendency of the blood to rapid coagulation. It has been attempted, with the view of obviating the latter, to inject the defibrinated blood only, the blood being received in an open vessel, rapidly stirred so as to promote coagulation, and then filtered. The result of this process does not seem to have been very successful, and it has therefore been proposed by Dr. Richardson, as a corollary to certain well-known experiments and conclusions of his, to prevent coagulation by the mixture with the pure blood of ammonia in the proportion of three drops to each ounce. With the same object in view, Dr. Braxton Hicks used the phosphate of soda. Some, arguing from the effects which have been known to follow the injection of a simple saline solution into the blood in the collapse of cholera, have advocated a similar mode of procedure in hemorrhagic collapse. The quantity to be introduced is much greater than when blood is used, and the following is the formula for the preparation of a solution which has been used by Dr. Little:

Chloride of Sodium, ...	60 grains.
Chloride of Potassium, ...	6 "
Phosphate of Soda, ...	8 "
Carbonate of Soda, ...	20 "
Distilled Water, ...	20 ounces.

Perhaps the simple apparatus and process of Dr. Aveling is the best for ordinary purposes which has hitherto been devised, and from its simplicity of construction, it may be used by any one possessed of moderate dexterity. The operation has not been confined to cases of post-partum hemorrhage, but has also been employed in placenta prævia, when the patient was too prostrated to survive delivery unless previously rallied. The successful performance of transfusion may, although followed by a rally, be again succeeded by renewed flagging of the circulation, and a recurrence of the original symptoms. In this case, it would be quite proper to repeat the injection. Professional attention has of late years been so thoroughly awakened to the importance of this procedure, that there exists in the minds of many experienced practitioners a strong hope, and some confidence, that obstetric mortality may in this way be in some measure reduced.

found the inst blocked with clots –
[illegible] method
[illegible] human
[illegible]
[illegible] experimental

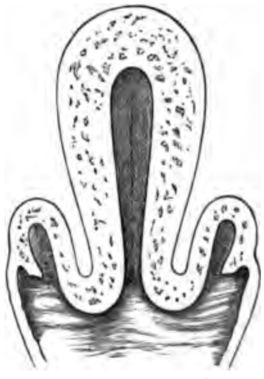
CHAPTER XXV.

INVERSION OF THE UTERUS.

VARIETIES OF INVERSION: THREE STAGES OF THE ORDINARY VARIETY—INVERSION USUALLY OCCURS DURING THE THIRD STAGE OF LABOR—INVERSION OF THE UNIMPREGNATED UTERUS—CAUSES: DRAGGING UPON THE CORD: SHORTNESS OF THE CORD: IRREGULAR CONTRACTION OF THE UTERUS—CONNECTION OF THIS ACCIDENT WITH HOUR-GLASS CONTRACTION—EFFECTS OF PARALYSIS OF THE FUNDUS—MECHANISM OF THE DISPLACEMENT—SYMPTOMS: PECULIAR VIOLENCE OF THE SHOCK: HEMORRHAGE: ABSENCE OF TUMOR IN HYPOGASTRIUM—TO BE DISTINGUISHED FROM A FIBROUS POLYPUS—SENSIBILITY AND OCCASIONAL CONTRACTILITY OF THE TUMOR—MODES OF PROVING THE ABSENCE OF THE UTERUS FROM ITS NORMAL SITUATION—RECURRENCE OF HEMORRHAGE IN CHRONIC INVERSION—TREATMENT: ORDINARY METHOD OF REPLACEMENT: MANAGEMENT OF THE PLACENTA IF STILL ADHERENT: MANAGEMENT OF MORE DIFFICULT CASES: COMPRESSION OF TUMOR: DEPAUL'S INSTRUMENT—CHRONIC INVERSION: MONTGOMERY'S METHOD OF REPOSITION: CONSTRICTION OF THE OS MUST BE OVERCOME: EFFECTS OF SUSTAINED ELASTIC PRESSURE—DIVISION OF THE STRICTURE: REMOVAL BY THE ECRASEUR.

INVERSION of the Womb has already been referred to in the preceding chapter as one of the causes of hemorrhage after delivery. There are, in addition to this, other circumstances, of no less importance, which render the subject one demanding, at our hands, special and careful consideration. Although the accident is by no means of frequent occurrence, it is not to be supposed that, on that account, it is necessarily to be treated as one of minor consequence. On the contrary, it involves so many practical questions, and is, moreover, a subject in regard to which so much misapprehension has existed, and still exists, that it is necessary to devote somewhat more of space to its consideration than its importance might, in the first instance, seem to warrant.

FIG. 131.



Partial inversion. (After Matthews Duncan.)

The idea essentially involved in the term "Inversion of the Womb" is an abnormal condition of that organ, in which, in extreme cases, the whole organ is turned inside out. As has already been remarked, such a displacement must, in becoming complete, pass through a variety of stages; and as, at any one of these stages, the inversion may be arrested, it is possible to imagine an almost infinite number of varieties of inversion. We shall, however, only mention four. Of these, the first is not generally described, but is said by Dr. Matthews Duncan to be "not rarely observed after delivery." The condition of the parts is, as shown in the diagram (Fig. 131), and consists, therefore, in an inversion of the inferior segment of the uterus only. This variety, although, probably, not uncommon, is of no great practical importance, as it will rectify itself without assistance. It is otherwise with the three varieties which are figured diagrammatically in Figs. 132, 133, 134. All these are, as will be observed at a glance, merely stages in the progress of the same accident, which is the true Inversio Uteri of authors, and which differs from the other and less important variety, in commencing at the fundus. It is quite possible that the variety represented in Fig. 131, might, as in the other case, terminate in complete inversion; but the experience of all goes to show that the ordinary course is first, one of Depression of the Fundus (Fig. 132); second, one of Partial (Fig. 133); and, third, one of Complete Inversion (Fig. 134). In a stage more advanced still, the inverted womb may protrude from the vulva,—a condition which necessarily involves at least partial inversion of the vagina, which is dragged down by the womb.

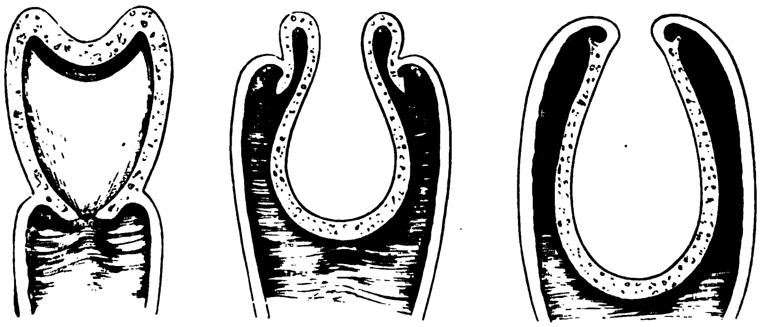


FIG. 132. FIG. 133. FIG. 134.

Successive stages of Inversio uteri.

Although essentially one of the accidents of midwifery practice, and usually occurring in the course of delivery, there are cases in which the uterus becomes inverted independently of the pregnant state. Most of those are instances in which there is either a polypus within the cavity, or a fibroid growth in the walls of the uterus, which, by acting in a manner as foreign bodies, excite the organ to contractile and expulsive action, which terminates in inversion. It is a disputed point, whether inversion of the normal and unimpregnated uterus is, in any other circumstances, possible. On this point Dr. West says, "Inversion of the uterus, the turning of the organ inside out, is an accident clearly impossible in the natural condition of the unimpregnated woman,—it being obviously essential for its occurrence that the organ should have attained a certain size, and that its walls should be comparatively yielding." This opinion is adopted by Matthews Duncan and others, but Dr. Tyler Smith believes, on the other hand, that the unimpregnated uterus may invert itself, under the influence of irregular contraction. We are not aware that any case has been recorded, in which the evidence of inversion, under such circumstances, is not open to doubt, more or less strong. At the same time, we must confess that we incline to Tyler Smith's conclusion. It is certainly true, as he says, "that the unimpregnated and virgin uterus, particularly under irritation, possesses more motor power than is generally attributed to it;" and we can see no physiological reason which can warrant us in assuming such an inversion to be impossible. Many years ago, we had occasion to assist at the post-mortem examination of a young woman who had died of fever, and who had suffered previously to her death from severe flooding. The uterus was found completely inverted, and of very little, if any, greater size than the normal unimpregnated standard. There was neither polypus nor fibroid growth. This case corroborates strongly the assertion of Tyler Smith, and, at least, proves that previous enlargement of the organ, and a yielding condition of its walls, are not, as West supposed, essential. There cannot be the slightest doubt that the presence of a polypus, or of anything else, within the cavity of the uterus must so far encourage inversion, both mechanically and physiologically. In the above case, there may have been a clot: but whether or no, it, and other cases of an allied nature, seem to show that inversion of the unimpregnated uterus, independent of polypus, or any other similar condition, may occur.

Causes.—The occurrence of uterine inversion, coincident, as is to be feared, very frequently, with the practice of dragging upon the cord after the termination of the second stage of labor, has led not unnaturally to a prevalent belief that this was the usual cause of the accident in question; and it has also been supposed to be due, in some instances, to spontaneous dragging by a funis which is either too short, or has been rendered so by twisting round some part of the child. According to these ideas, the uterus must be looked upon as a passive agent, the fundus or site of placental attachment being mechanically displaced in a direction downwards, and ultimately through the os and into the vagina. That a certain number of cases are thus produced, most observers will probably admit; but the conclusion arrived at by all who have paid, in recent times, most attention to the subject, is, that the importance of this, as a cause, has been in every way exaggerated. A strong pull at the cord, while the uterus is in a state of flaccidity or complete atony, may doubtless—and especially if the placenta be morbidly attached—at once turn the organ inside out. Indeed, if such flaccidity were the normal condition of this stage, it would be a matter of wonder that the accident should not invariably accompany every effort in this direction, did we not observe that nature here interposes her authority, and effectually guards the woman, as we shall see, from the effects of operative mismanagement. Nothing, as a moment's reflection will show, is so certain, so effectual a safeguard against inversion, as regular and symmetrical contraction of the whole uterus. It is fortunate, therefore, that a very usual effect produced by pulling upon the cord is a contractile action of this nature, by which, for the time being, depression or introcession of any part of its walls is rendered impossible. Be it observed, however, that this observation applies to *regular* contraction only.

The uterus does not, in every instance, follow the method of regular contraction. On the contrary, it not unfrequently is the seat of *irregular* contractions, which affect certain portions only of the walls, while other parts are left in a temporary condition of relaxation or atony. One form of this has already been mentioned as a cause of retention of the placenta by what is familiarly known as "hour-glass" contraction of the uterus, and otherwise as "encysted placenta." It would seem as if, in the opinion of many, this was the only form of irregular uterine contraction, whereas there can be little doubt that an infinite variety of such irregularities may exist. It is, in fact, among such abnormal conditions that the true cause of ordinary cases of inversion is to be sought. Many of the older writers recognize the presence of such contractions as we now allude to; and one of the earliest observations in this direction was, that a frequent site of this localized inertia is that portion of the uterus upon which the placenta happens to be implanted. The important bearing which this has upon the cause and mechanism of hour-glass contraction was clearly pointed out by Levret, although altogether overlooked by many subsequent writers. "The neck of the uterus," says Madame Lachapelle, "is often inert, although the fundus is contracted; sometimes the reverse happens, and it is then that the placenta, inclosed in the uterus, appears to be encysted in it." As the nature of these and other abnormal conditions of contraction has been more exactly ascertained, the relation which they bear to inversion of the uterus comes into view. All modern observers agree in the observation that a local uterine paralysis, involving, as a matter of course, more or less irregular contraction, occurs more frequently at or near the site of the placenta than in any other part of the uterus. As this is the part which, by its introcession or depression towards the centre of the uterine cavity, forms the first stage of inversion, the coincidence of the displacement with the site of local paralysis has drawn special attention to the fact. Rokitansky, in his work on Pathological Anatomy, says on this point: "We must here mention a very singular circumstance, which may, on account of the consequent danger, become important, and may even be misunderstood in post-mortem examinations; it is paralysis of the placental portion of the uterus, occurring at the same time that the surrounding parts go through the ordinary processes of reduction. It induces a very peculiar appearance. The part which gave attachment to the placenta is forced into the cavity of the uterus *by the contraction of the surrounding tissue*, so as to project in the shape of a conical tumor, and a slight indentation is noticed at the corresponding point of the external uterine surface." Whether the words which we have placed in italics represent or not the real cause of the first stage of displacement is a question not as yet definitely settled. Matthews Duncan, in his essay on this subject, maintains that the uterus cannot itself effect introcession, and that it must, on that account, in every instance, be commenced by a force external to the uterus. In the case of dragging upon the cord, we have a force of this kind acting from below; and, as regards spontaneous inversion, he assumes that we have a cause of a similar nature acting from above in the mechanical conditions of the abdomen, which are called into play, and which take the effective form of what is familiarly known as "bearing-down" effort.

Whatever may be the view entertained as to the initiatory process by which spontaneous uterine inversion is effected, numerous authentic facts attest that such an occurrence takes place by the operation of causes which may be at once abnormal and spontaneous. So soon as the stage of depression has been established, as represented in Fig. 132, the further progress of the case admits of easy explanation. The analogy which at this stage exists between inversion and an ordinary case of "hour-glass" contraction has not failed to attract the attention of many of the more eminent writers on this subject. In both, we find the region of the fundus in an abnormal condition of atony, but the parts below are in a state of more or less efficient contraction. A stimulus to sustained and active contraction is afforded by the presence within the cavity of a tumor. "The annular contraction of the body of the uterus grasps," says Tyler Smith, "the introcedent fundus as it would a foreign body, and carries it downwards for expulsion through the os uteri, the os itself being at this time either in a state of inertia, or actively dilated, just as at the end of the second stage of labor. After the inverted uterus has passed through the dilated os uteri, this part of the organ becomes contracted, preventing reinversion from taking place. Thus there is, first, the depression of the fundus uteri, with annular or hour-glass contraction of the body of the uterus, and dilatation of the os uteri. Next, there is intussusception of the fundus by the body of the uterus. Lastly, complete inversion occurs, with contraction of the os uteri upon the inverted organ. If we wished to describe this action in three words, they would be—introcession—intussusception—inversion" (see Figs. 133-134).

It must not be supposed that, by thus supporting the doctrine of spontaneous inversion, the production of the accident by artificial or violent causes is ignored; still less, that any support is given by implication to the improper practice of pulling upon the cord with the view of effecting separation of the placenta. It will be inferred from what has already been said, that there are two classes of cases, in one of which the uterus is completely and in the other partially paralyzed. Inertia, therefore, in some form or another, is an essential concomitant of all cases of inversion. In complete atony of the organ, uterine activity can take no part in the displacement, although bearing-down or abdominal effort may; but in the other variety, where, as has been shown, local paralysis has its usual seat about the fundus, uterine effort is the efficient cause in all cases of spontaneous inversion, and in those in which the displacement is artificially produced, there is every reason to believe that there must be, so to speak, a consenting action on the part of the uterus, which then acts in unison with the force which is applied. If any further evidence were held to be necessary to establish the fact of such an occurrence, it is to be found in the instances which have been put on record of post-mortem inversion, which can only thus be satisfactorily explained.

Symptoms.—Inversion generally takes place after the birth of the child, and before the placenta has been expelled. The patient being thus under the immediate observation of the accoucheur at the moment of the occurrence of the accident, the first symptom which will, in all probability, attract his attention, is a condition indicating shock, out of all proportion to the circumstances, even of a lingering or exhausting labor. The violence of the shock, and the disturbance of the nervous system which accompanies it, bear no relation to the degree of the inversion. We would naturally expect that, in the stage of depression or introcession, the symptoms would not be so severe as in the more advanced stages; but in respect of these latter it has been observed that the amount of shock attendant upon intussusception and complete inversion is as great in the one case as in the other. The degree of constitutional disturbance depends, however, in a great measure upon the amount of hemorrhage, and this again upon the extent to which the placenta has become separated. In all cases in which complete separation of the placenta may have occurred, the hemorrhage is alarming, and may be so severe as to place the life of the patient within a few minutes in most imminent peril. But if the contraction of the cervix is firm, it may be by this in some measure controlled.

The occurrence of such symptoms is accompanied by an unusual condition of parts, as examined through the abdominal walls. In the stage of depression we may feel the outline of the uterus, but it is no longer a spheroid, for its centre presents a cuplike depression, which can be distinctly felt by the fingers. In the more advanced stage, however, the hard tumor which the uterus should in normal circumstances form behind the pubis is absent, nor is there in its place any such condition of general tumidity as might indicate a flaccid organ distended with blood. The uterus has, in fact, passed beyond the reach of the fingers in this direction. If we now make a vaginal examination, the nature of the case is at once revealed. A firm rounded tumor is here felt, which may also protrude externally. If to this the placenta is still partially or entirely adherent, there is of course no possibility of error, but when the placenta has become separated, no inconsiderable perplexity and difficulty may arise.

The distinction between a fibroid polypus and a partial inversion has already been alluded to under the head of post-partum hemorrhage. In addition to what was then remarked, we need only observe here that, in some cases, the sense of touch affords little reliable information, as there is in this respect such variety in the texture both of polypi and inverted uteri, that the most skilled observer could scarcely by this alone distinguish between the two. The really important point in diagnosis is this, that polypi, owing to the narrowness and length of the pedicle, can generally be moved much more freely, and may be twisted to a greater extent on their long axis without giving rise to any particular pain. Any attempt which may, on the other hand, be made to twist the tumor which is formed by an inverted uterus, is attended with considerable pain, and can, moreover, be effected only within the narrowest limits. If there is any inherent contractility in the tumor, this at once shows that it is the uterus. If the inversion is complete, the continuity of the vagina with the lateral walls of the tumor enables us by the finger to recognize the nature of the case; but when the intussuscepted fundus is tightly grasped by the os and its diameter at this point thereby reduced, the resemblance to a fibroid polypus is greatest, and it is here that the tests of immobility and sensibility may be most usefully applied. The nature of the case may be still more conclusively demonstrated by such modes of examination as may prove the absence of the uterus from its normal situation. On this point Barnes recommends that we should pass one or two fingers into the vagina to the root of the tumor, and then press down the fingers of the other hand behind the symphysis. If in doing this we can make the fingers meet, and feel from the outside the funnel of the inverted uterus, our diagnosis will be confirmed. Or again, we may pass a finger into the rectum so as to get its point above the root of the tumor, and then pass a sound into the bladder, with its point turned backwards, so as to meet the finger in the rectum, which, if it can be effected, will equally show that the uterus is absent from its usual situation, and consequently, by inference, that the tumor in the vagina is the uterus.

Simple prolapsus or procidentia, when occurring immediately after labor, may also be mistaken on a careless or cursory examination for inversion, but more careful observation will at once in such cases disclose the real nature of the case, so soon as the depression corresponding to the os and the orifice itself is recognized in the centre of the projecting tumor.

The symptoms above enumerated are those of an ordinary case of uterine inversion occurring in the course of labor, and do not, of course, apply in all respects to the other and rarer varieties. Assuming it for the moment as proved, that inversion of the unimpregnated organ is a possible occurrence, it is undoubtedly so rare that little or nothing can be said as to its symptoms; but we may assume that hemorrhage, pain, and nervous shock will be among these, and that the diagnosis may be unusually difficult. There may be cases, again, in which the presence of a polypus is established, and yet inversion may occur, the two conditions thus coexisting, although the former has in all probability been the direct cause of the latter. There are yet other instances in which inversion may succeed delivery, and yet not follow so closely upon it as under ordinary circumstances it does. Possibly in such the initiatory stage of depression has alone been produced during labor, and this again has been transformed into one or other of the more advanced stages by irregular contraction or modifications of what are known as after-pains. It would appear as if occasionally the symptoms, at the time of the inversion, were not so marked as usual; for there can be no doubt that the accident has sometimes been altogether overlooked at the time of labor, and only discovered long after. When the woman recovers from the immediate effects of inversion, she may regain her health and strength as if nothing ailed her, and be able to follow her ordinary avocations. But, in such cases, the original symptom of hemorrhage will, sooner or later, return, and, by its periodic recurrence —corresponding often, as might be anticipated, to catamenial periods— saps the strength and undermines the health of the patient. These constitute cases of Chronic Inversion.

Treatment.—Whatever the stage may be at which inversion of the uterus is recognized, our duty is to reduce the dislocation of the fundus without unnecessary delay. If we were fortunate enough to discover what has happened immediately, there would probably be but little difficulty in effecting the reposition, as we would then find the os in a state of relaxation. This period is, however, of brief duration, and is followed by contraction of the os, which grasps the organ firmly, and in this way adds very greatly to the difficulty of the operation.

If the placenta is still adherent, it is a question whether we should at once separate it. The advantage of this procedure is, that the fundus will undoubtedly be more easily reduced than when its bulk is increased by the presence in its immediate neighborhood of the mass of the placenta; while, on the other hand, the obvious disadvantage of the separation is to encourage hemorrhage by rupturing the utero-placental vessels. Both methods of treatment have been adopted, but it is certain that neither of them can be held as applicable to all cases. Reposition along with the placenta is, in fact, only applicable to those cases in which the os is relaxed, and is all but impracticable in the other class of cases, where we may find it difficult enough to return the fundus alone through the stricture formed by the os. Practically, the question may be said to stand thus: return the placenta if you can, or attempt to return it, if you can see a reasonable prospect of doing so without the exercise of undue force; otherwise, separate the placenta at once, and do not waste time which may be of inestimable value in the interests of your patient. To remove the placenta from its attachments, insert the finger beneath the edge, and gradually strip it from the entire surface to which it is adherent. The diminished size, and at least partially contracted condition of the uterus, lessen to a considerable extent the danger which we would naturally anticipate from hemorrhage; but the risk is still sufficient to render it imperative that we should make no delay at this stage, but proceed at once to the reduction.

The method which is usually recommended is to bring the points of the fingers together, and to apply the apex of the cone thus formed firmly to the centre of the displaced fundus, which is by this means to be steadily pushed upwards in the axis of the pelvis, so as to carry the fundus through the ring formed by the contracted os. Due caution must, of course, be exercised in regard to the amount of force which is employed, as it is possible by violence to inflict very considerable injury upon the uterine tissue. So soon as the fundus passes through the os in the process of reinversion, it must be followed upwards by the finger, to render the operation complete. While this is being effected the organ is to be steadied, as far as is practicable, by the hand, which is placed upon the abdomen, and the operator must, in addition to this, be careful to direct the force to one side or other, so as to avoid the sacral promontory.

When a certain time, even an hour after, has elapsed since the displacement has taken place, the difficulties of the operation may be considerably increased; and when this has extended to days it will naturally become more difficult still. The effect of the strangulation of the neck of the tumor is to cause general tumefaction of the parts beneath, so that it will often be necessary to compress the organ from side to side, in order to curtail its dimensions in that direction before attempting actual reduction. By this manœuvre a difficulty, which may at first seem insuperable, will sometimes be overcome. By the ordinary procedure, by means of the fingers, the reposition of the uterus has been found by some operators to be so difficult that instruments have been used, which, being of less bulk, offer certain mechanical advantages. Of such a nature is the *bâton repoussoir* of Depaul; but to this it may fairly be objected that the gain is probably more than counterbalanced by increased risk; and it must be confessed, in this as in many other operations in midwifery, that the more experienced and skilful the accoucheur, the more does he prefer his fingers to mechanical aids, however ingenious.

When the fundus has passed to a certain distance within the os, it has very frequently been observed that the same muscular action of the uterus which originally contributed to the dislocation of the organ now comes into play as an auxiliary to reposition, and it is very frequently observed that the ultimate complete restitution of the fundus is effected by a sudden jerk or snap, which is often quite audible to the bystanders. In those instances, however, in which the inertia of the organ is persistent, it will be necessary to pass the hand quite within the cavity, until we are convinced that its anatomical relations are completely re-established. Nor is it proper at this moment, and at once, to withdraw the hand. We should rather act here as we would do in a case of encysted placenta, or of post-partum hemorrhage, in which the hand is introduced for the removal of the uterine contents; and it is, therefore, advisable to allow it to remain in contact with the uterine walls, and to act with the other hand, in concert with it, through the abdominal walls, so as to excite the organ to efficient and symmetrical contraction, which is a safeguard both against hemorrhage and reinversion.

There is another class of cases in which the difficulties are still more formidable than any which have hitherto been described. It may be assumed that the longer the standing of the case the more serious will be the obstacles to reduction, until it reaches the condition to which the name Chronic Inversion has been given. Where, it may be asked, may we assume acute inversion to end, and chronic inversion to begin? The only rational reply to this question with which we are acquainted is that which is given by Dr. Barnes in his recent work. "I would distinguish the cases in this way: Inversion is recent so long as the physiological process of involution of the uterine tissues is going on. When this process is complete, and the uterus has returned to its ordinary condition, the inversion is chronic." In all cases of unusual difficulty, whether recent or chronic, the process of taxis, recommended by Montgomery, McClintock, and other distinguished practitioners of the Irish School, may be attempted. The idea here is to regard the inversion as a hernia, and to replace that part first which comes down last. The neck of the tumor is to be firmly grasped, and pushed upwards, continuous pressure being thus maintained upon the contracted os. If the cervix can be insinuated within the lips of the os as the latter relaxes, the rest of the tumor is to be treated in a similar way, until at last the fundus returns to its place in the usual sudden manner.

It was at one time generally supposed that, when a few hours had been permitted to elapse, inversion might be looked upon as irreducible. The results of modern practice have, however, clearly demonstrated that such an idea is quite untenable; and it may now be confidently asserted that no condition short of inflammatory adhesion of the parts will warrant such a conclusion, whatever the duration of the case may be. The great point to be kept before us, and against which all operative effort is to be directed, is the contracted state of the os. However hopeless, therefore, on a cursory examination, the case may seem to be, we may be confident that *sustained* effort will, in the end, overcome the resistance. But to be effectual it must be continuous; and we have only to reflect upon the fact that Tyler Smith succeeded thus in reducing an inverted uterus of ten years' standing, and that a number of cases are on record of a similar kind, to encourage us, even under the most unpromising circumstances, in diligent and untiring effort.

Pressure effected by means of the hand of the operator, although perfectly safe, cannot be maintained for a sufficiently long period, and is thus inapplicable to the class of cases which we are now considering. The very obvious danger which would attend the use of any solid material, has led to the employment of air or water bags, which are to be introduced into the vagina, and gradually distended. This elastic pressure is, when properly applied, perfectly safe, and can usually be borne by the woman without much uneasiness. In Tyler Smith's case, above referred to, the details of which will be found in the "Medico-Chirurgical Transactions" for 1858, the pressure was kept up for more than a week; and, in many other cases, a similar process has been attended with equally satisfactory results. The mode of action in these seems to be that pressure is indirectly brought to bear upon the os from within. At first, this is as ineffectual, or even more so, than the previous efforts, which have already been made with the view of effecting reduction by manual interference; but, in the end, the long-continued pressure wears out the spasm, the os yields, and reinversion occurs.

In those instances in which it is said that the organ has been spontaneously restored to its normal condition, as in a case narrated by Baudelocque, it is certain that a spontaneous relaxation of the os must have occurred, and it is probable that, along with this, the inverted organ had been subjected to some pressure in its new situation from permanent or temporary causes. The theory that a spontaneous reduction may take place in consequence of tonic contraction of the Fallopian tubes and of the broad or round ligaments, appears to us to be in the highest degree improbable. The condition, of all others, essential to replacement is, we repeat, relaxation of the os. There may be cases, however, in which even sustained elastic pressure may fail to effect the object which we have in view, although we have every reason to believe that such must be of rare occurrence. But, even under such circumstances, our resources are far from being exhausted, and various methods have been adopted for overcoming the difficulty in individual cases, which it would be impossible to describe here. The idea of section of the constriction must have often suggested itself; but Dr. Barnes was probably the first to carry a case to a successful termination by this operation.[1] The proceeding, as described by him, is as follows: "Draw down the uterine tumor by means of a loop of tape slung round the body, so as to put the neck of the tumor upon the stretch; then with a bistoury, make a longitudinal incision about half an inch long, and a quarter of an inch deep, on either side, into the constricting os; then reapply the elastic pressure. Next day, try the taxis, and reapply the elastic pressure if necessary. Elastic pressure alone, or aided by this operation, will, I am convinced, overcome every case of inversion, except when fixed by inflammatory adhesions."

Very rare cases have been met with in which menstruation has gone on regularly from the surface of an inverted uterus; and, indeed, observation of such cases has thrown some light upon the source of the menstrual discharge. In such cases, leucorrhœa, and the presence of a tumor within the vagina, may be the only symptoms, but the almost invariable rule is repeated flooding, and that to such an extent as to bring the patient into a condition of immediate danger. Failing all the means already detailed—in the practice of which it has been assumed that full advantage has been taken of chloroform, an invaluable agent in all cases of uterine spasm—is there any other method which we may adopt for the relief of a woman who may be dying before our eyes from the effects of this accident?

The only possible remedy in such a case is removal of the inverted uterus, as this alone can be expected effectually to check the hemorrhage. The objections to such a procedure are sufficiently manifest; for not only is the case one of mutilation, by which the woman is unsexed, but it is one the immediate risk of which is very great. Still, the operation has been repeatedly performed with success, and the woman has enjoyed perfect health for many years thereafter. In the only case which has come under our observation, the patient, who was operated upon about seven years ago, is still alive, and in perfect health; and it is worth remarking, in addition, that she has never menstruated since, but that the menstrual molimen is apparently relieved by periodical or vicarious leucorrhœa. If, therefore, the doom of a patient seems fixed, if we decline to interfere, we can have no hesitation in resorting to a measure so extreme as the removal of the organ: and, of course, at the present day, the operator would select the écraseur in preference to the older methods of ligature or excision. The best instrument for the purpose is the wire-rope écraseur of Braxton Hicks, which may be used either with fine wire twisted into a rope as recommended by the inventor, or with a single strong wire as is recommended by Barnes. The responsibility which attaches to an operation such as this cannot fail to weigh upon the operator; and he will, therefore, at once recognize the necessity, before finally committing himself to this course, of making himself sure on two points: first, as to the accuracy of his diagnosis; and, second, that the tumor is beyond all doubt irreducible.

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[1] Medico-Chirurgical Transactions. 1869.

Until we can form a confident opinion in regard to both these matters, we cannot, in any case, conscientiously proceed to operation; and it must also be borne in mind that the more perfectly does our knowledge of the accident become developed, the more completely does the operation for removal of the organ seem to have fallen into disuse and disfavor.

CHAPTER XXVI.

RUPTURE OF THE UTERUS.

RUPTURE DURING PREGNANCY—RUPTURE DURING LABOR—PARTIAL OR INCOMPLETE RUPTURE—SITE, EXTENT, AND DIRECTION OF THE LACERATION—REASON OF THE COMPARATIVE FREQUENCY OF CERVICAL RUPTURE—IS RUPTURE LESS COMMON IN PRIMIPARÆ?—EFFECT OF THE DURATION OF LABOR—CAUSES—A. MECHANICAL: SEX; PELVIC DEFORMITY; FAULTY PRESENTATION; PRESSURE UPON THE CERVIX; OPERATIVE VIOLENCE; ERGOT; VIOLENT UTERINE ACTION—B. REFLEX: EXCITEMENT OF CERVIX, ETC.—C. PATHOLOGICAL: CANCER; RIGIDITY OF THE OS; THINNING OR PARTIAL ATROPHY; SOFTENING; FATTY DEGENERATION—SYMPTOMS—PREMONITORY: LOCALIZED PAIN INCREASED DURING LABOR—SIGNS OF RUPTURE: PAIN; HEMORRHAGE; SHOCK; RECESSION OF THE PRESENTING PART—LACERATIONS INVOLVING THE VAGINA—TREATMENT—PREVENTIVE MEASURES: DELIVERY BY THE FORCEPS OR BY PERFORATION—EXTRACTION OF THE PLACENTA—HERNIA OF THE INTESTINE—IF FŒTUS HAS ESCAPED INTO THE PERITONEAL CAVITY, TURNING RECOMMENDED: GASTROTOMY IS, HOWEVER, TO BE PREFERRED—FURTHER MANAGEMENT OF THE CASE—TREATMENT OF RUPTURE OF THE UTERUS IN VARIOUS STAGES OF PREGNANCY.

RUPTURE of the Uterus, at all times one of the most appalling accidents of midwifery, is also the most fatal; and is the more terrible, as in many cases it can neither be foreseen nor averted. The elaborate statistics for which we are indebted to Dr. Churchill, show the accident to have occurred in 85 out of 113,138 cases of labor—about 1 in 1331. Although rupture almost invariably occurs in the course of labor, it is not always so, as a certain number of well-authenticated cases have been put on record, in which rupture occurred at various periods in the course of pregnancy, in the absence of any uterine action whatever. Some of these cases have been the result of violence, and a considerable number seem to have followed overexertion of some kind or other. But there are others in which no such cause can have been in operation, as in a case published in the *Medical Repository* by Mr. Scott of Bromley, in which a woman, in the sixth month, was awakened from sleep by a sudden pain about the umbilicus, which was soon succeeded by collapse and death. On examination, after death, a rupture was discovered at the fundus, through which the fœtus, enveloped in its membranes, had escaped into the abdominal cavity. It would probably be impossible, in many of these cases, to distinguish between this accident and the rupture of the sac of an extra-uterine pregnancy, as the symptoms are, in the two cases, almost identical. The very rarity of spontaneous rupture has not unfrequently given rise to suspicion of foul play in such cases, and the question has, therefore, a medico-legal significance, in reference chiefly to criminal abortion; but there will probably be little difficulty in recognizing a spontaneous rupture on post-mortem examination, as this is generally at the fundus, while criminal injuries are more frequently discovered in the rigion of the os and cervix. Besides, the nature of the injury is so different, that the appearance of a spontaneous rent and a violent laceration could scarcely be mistaken; and, moreover, there often is to be found, as the cause of these ruptures, a diseased condition of the structures of the womb. Ruptures during the course of pregnancy may occur as early as the third month, but are more frequent, the more advanced is the development of the fœtus.

By far the greater number of cases occur during labor, and it is to these that attention must be more particularly directed. The laceration in these cases generally involves the entire thickness of the uterine walls, but there are exceptions to this rule. In some, the rent has been found to have extended through the mucous membrane and proper tissue of the uterus, and to have been arrested by the peritoneum, which had remained intact. The mobility and distensibility of the peritoneum upon the subjacent uterine tissue in some measure encourages this; and it is, therefore, at the lower portion, where the connection of the peritoneum is looser, that this has been more frequently observed. The result of such cases, although often fatal, is not so much to be despaired of as when the laceration is complete; but a frequent result probably is the effusion of blood between the peritoneum and the tissues beneath, and the consequent formation of peri-uterine hæmatocele. In many of these instances, it is most likely that the fact of laceration is not recognized at all at the time of its occurrence. Another rare variety of rupture consists in numerous fissured lacerations of the external surface of the tissue proper of the uterus, immediately beneath the peritoneum, which may give rise, as in the other case, to subperitoneal hemorrhage; while, in other instances, the peritoneum itself is the only part which is lacerated, the uterine tissues escaping altogether.

Any part of the uterus may be the seat of laceration, while the rent in the tissues may take any direction, and, in extent, may be limited only by the size of the organ itself. It may thus be either longitudinal or transverse; and may, in the first case, correspond to the entire length of the uterus, and, in the latter, the laceration may extend completely around the uterus, thus dividing it into two. Both of these are extreme cases: the rent is generally much more limited in extent. Considerably more than a half of all the ruptures at the full time occur in the region of the cervix, generally at that part which marks the junction between the uterus and the vagina. Next in point of frequency comes the body; and last of all, the fundus, which is, as we have seen, the site preferred in early pregnancy. One of the most remarkable monographs on this subject is one which was published, in 1848, in the *American Journal of Medical Science*, by Dr. James D. Trask, and is based on an analysis of over four hundred cases. The following represents the proportion of cases in the various situations named, as deduced from his statistics:

Ruptures of the Cervix,	55 per cent.
" " Body,	36 "
" " Fundus,	9 "

The reason of the comparative frequency of rupture at the cervix is afforded by a moment's consideration of the mechanism of the dilatation of the os, which has been fully detailed in reference to the progress of the first stage of labor. The os, as was explained, is dilated by the combined action of the longitudinal fibres of the uterus and the bag of waters, or, in the absence of the latter, by the presenting part of the child; so that we cannot wonder that the usual seat of rupture is where the greatest amount of force is brought to bear. Trifling ruptures of the vaginal portion of the cervix are among the most common of the minor accidents of midwifery. But, even when lacerations of this part are much more extensive, the rent does not necessarily involve the peritoneum, so that the gravity of the case will depend chiefly upon whether or not that membrane is injured. In some rare instances, the laceration has extended into the bladder, and in others, rarer still, the whole vaginal portion of the cervix has been separated, in the form of a ring, which has been born with the child. Lacerations of the cervix alone are very common, and generally take a vertical direction. They are said to occur more frequently on the left than on the right side.

It was at one time generally supposed, and it is even now stated by many writers, that there is less liability to rupture in first than in subsequent pregnancies. A more correct observation of such statistics as bear on that subject,—among which those of Churchill and Trask are best known,—shows that this is not the case, but that there is, if anything, a preponderance of primiparous cases. The error has arisen from comparing first with all other labors; but, if we compare first with second, third, fourth, and so on, individually, but not collectively, the result will be found to be as we have said. Another view, all but universally held, was that the accident was a common result of protracted labor; and it is, indeed, not unnatural to suppose that this should be the case; but there is, perhaps no one point which is brought out more strikingly in Dr. Trask's cases than that the actual duration of labor has little or nothing to do with it. In 104 out of 147 cases, rupture occurred within twenty-four hours of the commencement of labor. It must, however, be remembered that the usual course of a protracted case is failure of the pains; so that, although we may fairly assume that long-continued effort would endanger tissues weakened by exhaustion, nature here arrests the pains, and thus interposes for the protection of the parts, vigorous action being only restored when she has had time to recruit her exhausted powers.

Causes.—Whatever views may be entertained in regard to the two conditions above alluded to, there can be no doubt that anything which mechanically impedes the course of labor is an undoubted cause of rupture of the uterus. The sex of the child thus plays, as might be expected, an important part, as is shown from the statistics of the Dublin Lying-in Hospital, extending over a long period, from which it would appear, that in nearly 70 per cent. of all the cases of rupture the sex was male. Trask's cases show, no less clearly, that pelvic deformity, or disproportion, is another important cause, which had been proved to exist in 74.74 per cent. of his cases. For the same reason, faulty presentations, which are an impediment to labor, may be the direct cause of uterine rupture; thus, in 303 cases given by Trask, of all presentations, 16 were presentations of the shoulder. Forcible compression of the neck of the womb between the head of the child and the pelvic walls is supposed by Dr. Murphy to play an important part in inducing rupture of the womb, so that if it is pinched anteriorly against the ilio-pectineal line, or posteriorly upon the promontory of the sacrum, anterior or posterior lacerations of the cervix are to be explained by the mechanical action of the fundus and the longitudinal fibres.

Although we have every reason to believe that the more accurate knowledge of modern times has had a marked effect upon the results of modern practice, it must still be admitted that operative violence cannot be overlooked as a cause of rupture of the uterus. We do not here refer to such cases as occur in consequence of causes of a pathological nature, to which we shall again advert, where the accoucheur is often unjustly blamed; but to those in which errors of judgment, or rashness in operative procedure, lead to this disastrous result. The most common of all midwifery operations, for example, may, in any case, be attended with extensive laceration; for, if we apply the forceps without due consideration, and careful observation of the state of the os, we may readily rend those tissues and destroy our patient. In the same way, clumsy manipulation in turning may, at any stage of that operation, in a moment plunge a satisfactory case into the category of hopelessness; and so, in a hundred different ways, operative incompetency may, in the attempt to shield the woman from danger, only precipitate her doom. The improper administration of ergot has, there is only too good reason to believe, been attended with a similar result in no insignificant number of cases, where that powerful drug has been given in tedious cases, without any reference whatever to the amount of mechanical resistance which has to be overcome; and we rather think, that if the truth were known,—which, for obvious reasons, is often withheld,—this, as a cause of uterine rupture, would stand prominently forward. Professor Bedford of New York has in his museum four wombs ruptured by the improper use of ergot. A preternatural violence in the uterine contractions, even when associated with no marked resistance beyond what is perfectly normal, may also induce rupture by the actual impetuosity of the propulsive effort; but such cases, in the absence of morbid excitement of some kind, are probably very rare. When such morbid excitability does exist, it is astonishing, however, by what trifling causes violent action may be set up. It is by no means rare, that the slight irritation of the cervix which occurs in the course of an ordinary vaginal examination, arouses, by a reflex act, an amount of expulsive effort which may thus lead to rupture from a cause apparently so simple. Examples of this kind have been from time to time recorded, but cases which are centric in their origin are, undoubtedly, of far more frequent occurrence. Rupture has occasionally taken place, or has been extended, during straining at stool.

Special attention has of late years been directed to certain pathological conditions, upon which there can be no doubt that rupture of the uterus occasionally depends. It is in these cases mainly that, in the most skilful hands, and with every possible attention, ruptures quite unexpectedly occur; and in such the practitioner may be cruelly and unjustly blamed. This, indeed, is by no means the least important of the considerations, which invest this part of the subject with a special interest. Some of the pathological conditions referred to also act, like the class of cases already mentioned, mechanically. Of this nature is cancer of the uterus, which generally attacks the os and cervix, and which unfortunately, in some instances, proves no bar to conception. The nature of the disease, even when it has not passed to the more advanced stages, renders the affected tissues so undilatable, that laceration, under the influence of efficient uterine contraction, is almost inevitable; and, in more extreme cases, the only safeguard may be Craniotomy or the Cæsarian Section. Cases of extreme rigidity of the os and of the more external parts of the parturient canal, are by no means of rare occurrence in practice; and, if they should chance to be accompanied with, or complicated by, violent uterine effort, rupture may not unlikely occur. There are, however, other conditions in which laceration may take place quite independently of excessive muscular action, or even in the absence of such action, as the history of uterine ruptures during pregnancy and before labor seems to show, and the interesting researches of Dr. Murphy at the Dublin Lying-in Hospital, clearly demonstrate. "Thinning, or partial atrophy of the uterus, is not an unfrequent cause," says Dr. Murphy; "four examples of this morbid change presented themselves to our notice. . . . . When a change of this kind takes place, the symptoms are often very obscure. There may be a very severe laceration without any severe pains, or any of those prominent symptoms that often precede the accident. You can appreciate what would be the effect of ergot of rye, if it were given to increase pains rendered feeble from this morbid condition of the uterus. Softening is another pathological cause of laceration. The fibrous tissue seems to be the first tissue affected; the mucous membrane may then be involved, but the peritoneum generally escapes. This morbid change may be only slight, affecting a few of the uterine fibres; or it may be extensive, converting the affected portion of the uterus into a putrid mass. Thus we have found a kind of aneurismal sac formed in the parietes of the uterus, in consequence of a partial rupture of the uterine fibres; no symptoms of laceration showed themselves during labor, nor did any appear until several hours afterwards, when the sac burst. In the same manner may be explained some of those obscure cases of sudden and fatal hemorrhage some days after delivery. Dr. Collins relates one in which the patient was seized with violent flooding on the fifth day after delivery. She died in an hour; and, on dissection, it was discovered that a patch of the uterus, of about the size of a shilling, had given way, corresponding to the projection of the sacrum."

Recent observations tend to show that that process of fatty degeneration which, as we have shown, is so essential a phenomenon of the normal process of involution (see Fig. 128, p. 361), sometimes takes place prematurely; and, if so, it can be readily understood how such an occurrence—under the circumstances, of course, a pathological one—must essentially contribute to the risk of rupture. And there can be little doubt, as Tyler Smith observes, "that in cases where the uterus is feebly developed, or weakened by disease and exhausted action, the contractions of the abdominal muscles must contribute to the rupture of the organ, by urging the head or presenting part of the child through the os uteri."

Symptoms.—The causes of rupture of the uterus being so various, it will excite no astonishment that the symptoms are far from being uniform. Very violent and tetanic uterine contraction, under circumstances which, for the time at least, render it impossible that labor can make much progress, will always excite our apprehension, and may seem to call for such means as we have at our command for moderating excessive action. But, the powers of nature are such that, even in the most unpromising circumstances, the dreaded result seldom ensues. The significance of the premonitory symptoms is, however, greatly increased if, along with contractions of this nature, the woman complains of pain of an unusual intensity; and, if the site of such pain should correspond to a point where it had been complained of before labor, our fears will be proportionally increased. We cannot, however, trust to premonitory symptoms. Indeed, in the great majority of cases, we have not even the benefit of such obscure signs as have been mentioned, and thus the climax of the case is attained while we are quite unprepared for a casualty so dreadful.

As a general rule, the symptoms which denote actual rupture of the uterus are well marked. At the height of a pain, a sudden and excruciating pang may occur. This is sometimes accompanied with a snap which may be audible to the patient and even to those about her. The pain suddenly ceases, and is almost instantly followed by alarming prostration and shock, which is modified, more or less, by the characteristic symptoms of hemorrhage. This may be altogether internal, or may be indicated by a gush of blood from the vagina, according to the portion of the uterus which has been the seat of the rupture. The countenance becomes pallid, with a fearful expression of alarm and anxiety; the face is bedewed with a clammy sweat, and the extremities and general surface become cold. The stomach ejects its contents, and at once throws off anything which may be swallowed; and it has sometimes been noticed, after protracted retching, that the matter vomited is of the color and appearance of coffee-grounds. The respiratiun becomes labored, and the pulse becomes rapid, feeble, irregular, and ultimately imperceptible. Simultaneously with these symptoms, the signs of the life of the fœtus disappear. In some cases, the occurrence of rupture is not marked either by acute pain or by the other symptoms above enumerated, and the dangerous condition of the patient may only become apparent after a considerable period has elapsed, it may be hours, or even days. These are, for the most part, cases in which the rent is comparatively trifling in extent; and, if it should so happen that the entire thickness of the uterine tissues has not been involved, the ordinary expulsive contractions may go on, although probably modified in degree.

A very usual and significant symptom is recession of the head of the child, which may have come to press on the perineum, or even to distend the vulva and come distinctly into view. If, along with symptoms such as have been described, the head suddenly recedes towards the upper part of the pelvis or passes beyond the reach of the finger, we can have little doubt as to the nature of the occurrence. We must here warn the young practitioner against an error into which he may fall, and which may cause him a considerable amount of unnecessary anxiety; for it not unfrequently happens, towards the termination of the second stage of labor, that the head suddenly and unexpectedly recedes, on the termination of a pain, to a much greater extent than is usual. Such an occurrence, however, need cause no alarm, as it is due to a mere temporary relaxation of the uterine walls, and is usually the forerunner of more efficient contractile efforts, under the influence of which the child is rapidly brought into the world. Complete recession of the presenting part, in rupture of the uterus, usually indicates that the child has passed or is passing through the uterine walls into the cavity of the abdomen, through the parietes of which the various parts of the child may be distinguished. In some cases, it would appear that the sudden cessation of pain was the only symptom of any importance, and it is worth remembering that this has been mistaken for inertia, and ergot administered.

There is a class of cases which, although not strictly speaking ruptures of the uterus, have so important an analogy to the latter that it seems proper to mention the subject here. These are ruptures or lacerations of the vagina. Lacerations of the lower part of the vagina are usually situated in its posterior wall, and, if they involve the superficial structures, they constitute the accident formerly described as Rupture of the Perineum. There are instances, however, in which the rupture of tissue is very extensive in so far as the vagina is concerned, and in which, nevertheless, the external tissues of the perineum remain quite uninjured, such cases proving both tedious and troublesome, although, as compared with rupture of the uterus, they are comparatively trivial. The lacerations to which allusion is here more particularly made, in reference to uterine rupture, are those in which the head of the fœtus after passing the os pinches in and compresses a zone of the vagina. The uterus in its contractile efforts pulls upon this fixed ring, precisely as happens when the cervix is similarly compressed, the result being a tear which is transverse in its direction, and may extend circularly around the entire vagina. It is important to know that, in such cases, the whole of the uterus and the upper part of the vagina has been expelled by the natural efforts, which has given rise to the charge of malpraxis. It has been denied by some that the uterus could in this way rend its ligaments, but recorded and perfectly authentic cases now clearly show that not only may the round and broad ligaments be torn away in this way, but that they may even be ruptured as a mechanifect of spontaneous inversion. Lacerations involving both vagina iterus are not uncommon, and it is probably difficult in some of instances to determine for certain in which of the two textures the re has had its origin ; but there can be no doubt that lacerations, of the cervix uteri or of the upper part of the vagina, must, in quence of their intimate anatomical relations, be very apt to extend the one to the other. A considerable hemorrhage could scarcely such cases to be a prominent symptom.

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Treatment.—It is scarcely necessary to observe that, if there be any possible means whereby we may succeed in preventing this accident, such must necessarily be by far the most important part of the treatment. But, unfortunately, the cases in which prevention is possible are rare; or, rather, the indications which demand preventive treatment are so obscure in their nature that it is difficult to tell, on the one hand, whether we are called upon to interfere, and on the other, whether, having interfered, the safety of the patient may fairly be attributed to our conduct in the case. The latter point is perhaps the most difficult of all. We recognize, let us suppose, a serious mechanical impediment to delivery, which coexists with violent and long-continued uterine effort, and which may seem to imperil the integrity of the uterine tissues. We operate, by the forceps, turning, or otherwise, and speedily relieve the patient; but when are we entitled to say that such prompt and decisive action on our part has actually averted a great calamity? We may, indeed, be perfectly certain that a well-considered and definite plan of treatment, in accordance with which operative assistance is afforded or withheld, will reduce rupture of the uterus to a minimum, as is well shown by the statistics of large lying-in hospitals, where this accident is one of those least frequently met with. It cannot, however, on the other hand, be doubtful that a needless dread of rupture, which inexperience is certain to exaggerate, leads in not a few instances to operative interference, which may be perfectly unnecessary, although the operator does not fail to congratulate himself on a fortunate issue, which he fancies to be due to his prescience and skill.

Apart from this, there are, however, certain conditions upon which an intelligent preventive treatment may be founded. The occurrence, for example, in the course of gestation, of acute pain, referable to some particular part of the uterus, has often been known to precede rupture in the part affected, which is believed in these instances to have been the seat of local or limited metritis. Should any suspicion, therefore, of this be entertained, it will be proper to adopt such means as may seem suitable with the view of subduing such morbid action as is assumed to exist. One, and by no means the least important, of the objects which the accoucheur has in view in inducing premature labor in cases in which there must be disproportion of parts at the full time, is to avert the danger of rupture which fruitless uterine effort might in any case produce. And he will, in like manner, feel himself impelled to prompt and energetic action, when the expulsive effort of the uterus is morbidly in excess. In some of these cases, the contractions attain a tetanic violence, which seems at every moment to imperil the integrity of the uterine tissues; and, if the period should not have arrived at which we may assist delivery by artificial means, we must then have recourse to such treatment as may subdue this violence,—of which bloodletting, the warm bath, opium, tartar emetic, and chloroform are the most familiar examples. In certain cases of extreme urgency, it may be necessary to enlarge the orifice of the vagina by lateral incision of the perineum; and, if we are certain that the child is dead, and it is making but slow progress under very violent uterine propulsion, we are justified in lessening the bulk of the head by the operation of craniotomy. In so far as the forceps are concerned—and the remark applies with still greater force to turning—we must not be astonished if any attempt at operative assistance should excite the organ to more violent contraction still, and thus defeat its own object. What constitutes morbid or excessive uterine action can of course only be learned by experience.

The treatment of actual rupture, however desperate the circumstances may seem, calls for every possible attention, not only in the interests of the child—which may often be saved—but in that of the mother, who may, even in unpromising cases, rally from the effects of the injury and ultimately recover. We must not, therefore, accept the dictum of Smellie, that the accident is an absolutely hopeless one. All the best authorities are agreed that a speedy removal of the child affords the mother the best chance, even when, the child being dead, this is done without any reference whatever to its condition other than considered as a foreign body. If the head of the child is still in the pelvic cavity, and thus within reach, it may be possible, although very rarely, to grasp and deliver it by the forceps; and, it need scarcely be said, that if this can easily be done, it ought to be preferred as the method which is at once easiest and safest. As, however, in a large proportion of such cases, rupture is associated with more or less of pelvic disproportion, the usual practice is to perforate and extract by the crotchet or craniotomy forceps, after having evacuated the contents of the cranium. This operation is, under such circumstances, attended with special difficulties, which may render its performance a matter of difficulty or impossibility. Instead of being, as in most other cases, firmly held in position by the uterus, the fœtus is apt to pass upwards on the slightest pressure towards the abdominal cavity; and, if the rupture be a transverse one, such pressure is apt to increase it; while, again, if a portion of the fœtus has already passed into the peritoneal cavity, the remainder may thus be propelled in the same direction. It has been recommended, therefore, in order to obviate these difficulties, to use the perforator so as to press the head back towards the hollow of the sacrum by directing the handles forwards as much as is possible in the direction of the subpubic angle. Success in an attempt such as this will be more probable if we avail ourselves of the aid of an assistant, whose duty it should be to maintain the child in the position which it occupies, by sustained and judicious pressure exercised through the abdominal walls.

If we succeed in this way in effecting delivery of the child, we may then encounter another, and probably a more serious difficulty in the extraction of the placenta. This organ, in a large proportion of cases, will be found to have escaped through the gap in the uterine parietes into the abdominal cavity, and, if contraction has subsequently taken place to any considerable extent, the aperture may thus be so reduced that great difficulty will be encountered in any attempt to draw it down. Too much caution cannot here be observed with the view of avoiding further laceration and extension of the wound. Were we to attempt to force the hand through the opening in order to seize the placenta, this would almost certainly occur. It is better, therefore, to use the cord as an extractor, and to pull the placenta towards the opening and then cautiously through it, and in this way complete the delivery. A prolapse or hernia of a portion of the intestine through the wound is by no means an unfrequent complication of such cases, and it is a matter of doubt in many instances whether we should or should not attempt to replace the protruding intestine. In so far as the risk of strangulation is concerned, this is a matter of trifling importance, for the usual situation and direction of the rupture, and the relation which it bears to the uterine fibres, render it a very unlikely matter that strangulation should occur; and, apart from the chance of a recurrence of the prolapse, it may fairly be doubted whether the risk of displacing the clots and again disturbing the wound will not do more harm than good,—as recovery has taken place even when a considerable coil of intestine has passed through the wound and occupied the vagina.

In a very considerable proportion of cases of rupture of the uterus, it is impossible to deliver by the natural channel, on account either of pelvic deformity, contraction of the os, or escape of the child into the abdominal cavity. In the first case our course of procedure will depend upon the degree and extent of the deformity; and in the second, the rigidity may possibly be overcome by the use of chloroform, or even by incision of the tissues of the os, our object being, in every case in which the child remains in the uterine cavity, to deliver, if it be possible, *per vias naturales*. But in the third case, when the child has escaped from the uterus, and lies among the intestines in the abdominal cavity, our treatment must be essentially different. So hopeless were such cases at one time generally regarded, that some of the most eminent accoucheurs—Denman among others—recommended that we should not in any way interfere, but leave the case to nature, as it has happened that women, even under such desperate circumstances, have recovered, the child ultimately being discharged piecemeal by the ulcerative process, as in cases of extra-uterine pregnancy. In several cases in which rupture of the uterus and escape of the child into the peritoneal cavity had occurred, it happened that delivery was effected and the woman saved by the operation of turning, the hand being passed through the rupture, the feet of the child seized and brought down, and the delivery completed in the usual way. The fortunate result of these cases gave rise to a very general impression that this was the method of treatment most suitable for such cases, but the gross results of the operation have turned out so unsatisfactory that a very general and growing belief now exists that, whatever may have been the result in rare and favorable instances, the chances of the woman are by this procedure rather diminished than increased. Dr. Barnes believes, and with some reason, that the cases alluded to were chiefly examples of rupture of the vagina, the rent of which is not contractile, and it is certain that it would scarcely be possible to deliver in this way, in an ordinary case, without displacing the clots, increasing the rent, and thus exposing the woman anew to the danger of increased hemorrhage and redoubled shock. If it is to be performed at all, it seems to us to be applicable only to such cases as present a cervical rupture of considerable size, and in which the general condition of the woman is unusually favorable.

The statistics of Dr. Trask, and the experience of later years, have very much modified the views previously entertained by competent authorities on the subject of gastrotomy in those cases of uterine rupture in which the child is in the peritoneal cavity. The dangers of such a course are manifest. There is increased shock, and the special risk which attaches to all cases in which the cavity of the peritoneum is opened; and in addition to this we may take into consideration the natural repugnance which is entertained by the patient's friends to such an operation, so long as another is in any way practicable. It must certainly be confessed that, in so far as it has been possible to institute a comparison between turning and gastrotomy in cases in which the child is outside of the uterus, the presumption is entirely in favor of the latter. The results of turning, and of removal through the rupture and the vulvo-uterine canal, are, according to Trask, as unfavorable to the mother as when we abandon the case absolutely to nature. But in those in which the operation of gastrotomy has been preferred, the results have been much more favorable, about two-thirds of the cases collated by Trask having been saved. We must be very cautious, however, in admitting such figures as representing the true facts of the case, as we cannot but believe that many fatal cases are, for reasons which are sufficiently obvious, suppressed. This is the reason why here, as well as elsewhere in this work, comparative tabular statements are omitted as likely to lead to misapprehension and false hopes. The safety of the child is in all such cases a secondary matter, but it may be admitted, as an element of the case for our consideration, that where the operation of gastrotomy has been promptly performed, the child has occasionally been saved. On the whole evidence, then, we must pronounce in favor of gastrotomy when the child is in the peritoneal cavity, of turning when it has remained in the cavity of the uterus, and of the forceps or perforation where the head can be easily reached within the pelvis.

The operation of Gastrotomy is simply the first stage of what will afterwards be more particularly described as the Cæsarian Section. A longitudinal incision having been made in the middle line, below the umbilicus, with those precautions which the modern operation of Ovariotomy has made familiar to us, the child is to be at once removed, along with the placenta and such clots as may be within reach. The wound should then be closed in the usual way, and a full opiate administered, while the patient is ordered to be kept in a state of perfect quiet, both of body and mind. Some difficulty may possibly arise both before and after the operation, as to the use of stimulants. Th condition of shock and general depression, and the state of the pulse may, on the one hand, indicate that we should not withhold them; but on the other our apprehension of the dreaded, though inevitable, peritonitis is such that we shrink from any treatment which might tend to aggravate that inflammatory action, upon the degree and extent of which the life of the patient will depend, more, perhaps, than upon anything else. It is, in fact, impossible, in this particular, to lay down rules for our guidance; so that we must act, to the best of our judgment, as the exigencies and peculiarities of an individual case may seem to indicate; but it will probably be necessary, in many cases, to rally the patient in some degree from the shock which has attended the accident, before proceeding to perform the operation which we may have selected.

In those cases in which rupture has occurred in the course of pregnancy, the treatment will, in some measure, depend upon the stage of pregnancy. In so far as rupture in the early months is concerned, something must be allowed for the difficulty of diagnosis, as it would be difficult, in such a case, to know whether it was a rupture of the uterus, or of the cyst of an extra-uterine pregnancy. This distinction is not, however, one of any great practical importance, as the treatment in the two cases is probably identical, and there seems no reason to doubt that, in this case, the best chance would be to leave all to nature, in the hope that, by the ordinary process of ulceration, the fœtus may ultimately be discharged. When the rupture takes place in the later months of pregnancy, the conditions are quite different, and the indications of treatment are more those of rupture during labor. If we are certain that the fœtus has escaped from the uterus, there must be no hesitation here as to the advisability of gastrotomy. For, with an os firmly closed, it would be futile to attempt dilatation of it and the cervix as a preliminary to thrusting the hand through the uterus into the abdominal cavity, so that we cannot here even think of turning. Some have recommended, when the child is still within the uterus, a forced dilatation of the os, and even excision, to be followed by turning; but we very much question whether, even here, it would not be preferable to perform gastrotomy, and extract the child from the womb by enlarging the laceration, should it be necessary. Under circumstances such as these, many would probably prefer trusting to nature.

CHAPTER XXVII.

DEFORMITIES OF THE PELVIS.

IMPORTANCE OF THE SUBJECT—CLASSIFICATION OF DEFORMITIES—CAUSES—DISEASES AFFECTING THE PELVIS: RACHITIS: MALACOSTEON: RICKETS AND MALACOSTEON CONTRASTED: NATURE OF THE BRIM DEFORMITY CHARACTERISTIC OF EACH—POSSIBILITY OF YIELDING IN A MALACOSTEON PELVIS—THE OBLIQUELY-DISTORTED PELVIS—DEFORMITIES OF THE CAVITY: FLATTENING OF THE SACRUM: FUNNEL-SHAPED PELVIS—DISTORTION OF THE OUTLET: APPROXIMATION OF THE TUBEROSITIES OF THE ISCHIA: PROJECTION FORWARDS OF THE COCCYX: ANCHYLOSIS OF THE SACRO-COCCYGEAL ARTICULATION—MASCULINE TYPE OF PELVIS—INFANTILE TYPE—EFFECT OF MUSCULAR ACTION IN PRODUCING PELVIC DISTORTION—SPONDYLOLISTHESIS—PELVIS ÆQUABILITER-JUSTO-MAJOR, AND JUSTO-MINOR—OBSTRUCTION FROM EXOSTOSIS, OSTEO-SARCOMA AND OTHER TUMORS; AND FROM FRACTURES OF THE PELVIS, AND MORBUS COXARIUS—SYMPTOMS—MEASUREMENTS OF THE PELVIS: PELVIMETERS—EXAMINATION BY THE FINGERS—EFFECTS OF DISTORTION—DIFFERENCE BETWEEN "IMPACTION" AND "ARREST"—TREATMENT—PREVENTION—CIRCUMSTANCES WHICH CALL FOR THE FORCEPS, TURNING, OR CRANIOTOMY—USE OF THE FORCEPS IN DEFORMED PELVIS—CÆSARIAN SECTION.

BEFORE passing to the more particular consideration of Operative Midwifery, it is proper that we should in the first instance turn our attention to the important subject of Pelvic Deformity; upon which condition a very large proportion of all midwifery operations depends. The first point which may be regarded as essential to the mastery of this important subject, is, beyond all doubt, a correct appreciation of the normal standard, or, in other words, an accurate knowledge of the anatomy of the female pelvis. Upon this also, as we have already seen, hangs the whole theory of the mechanism of parturition; but, so soon as deformity of any kind disturbs the relations which subsist between the various pelvic diameters, it converts the harmonious whole of a normal pelvis into discordant elements, to which it is impossible to adapt such laws as under ordinary circumstances guide our action. If the art of obstetrics stopped short here, it would have little claim indeed to the dignity of a science. No point, however, within the wide area of our subject, has attracted more of the attention of those to whose genius and industry we are under the deepest obligation; and the light which their experience and investigation has thrown on it, enables us in these days to look upon the deviations from the normal standard to which we have alluded with more of confidence than apprehension. For the occurrence of difficulties more or less formidable, then, we must be prepared, and nothing will suffice for an intelligent and satisfactory appreciation of these, short of an intimate knowledge of the causes upon which pelvic deformities depend, and the practical contingencies which they involve. Many attempts have, from time to time, been made to classify and reduce these morbid conditions into genera and species, but they have been attended for the most part, in so far as practical results are concerned, with but indifferent success. Many of the best authorities, whom we shall in this matter attempt to follow, abandoning any such scheme, have therefore attached to the conventional phrase, "pelvic deformity," a signification somewhat beyond what its etymology would seem to imply, so as to include, as we shall see, certain cases in which no deformity in the strict sense of the term exists, and yet in which the mechanical requirements of natural labor cannot possibly be assumed to exist. Many of the familiar terms arising from the systems of classification alluded to will be employed in the sequel, but only so far as may be necessary to meet the exigencies of formal description.

The *Causes* of pelvic distortion are various; but by far the most important of these are the diseases known as Rachitis and Malacosteon, which, although closely allied in respect of the morbid condition upon which they depend, are, nevertheless, to be carefully distinguished in regard to the difficulties which they engender, and the effects which they produce on the course of parturition otherwise natural. An elaborate consideration of the pathological conditions, symptoms, and progress of these diseases is altogether foreign to a work such as this; but there are certain points of similarity, and still more of contrast between the two, a knowledge of which is essential to a correct appreciation of the subject in all its bearings, and to which, therefore, it is necessary that we should at this place briefly advert. One of the most essential, and, in regard to our subject, one of the most important points of distinction between rachitis and malacosteon is, that while the former is a disease of childhood, the latter is a disease of adult life; and it is only necessary to compare the form, and degree of inclination of the pelvis of an infant (see Fig. 17), with that of the adult, to see that the effect which must inevitably be produced in the two cases, by a yielding of the osseous structures, can only be attended with results, as regards the measurements and form of the pelvis, which of themselves would suffice to establish a marked distinction between them. Such differences in form as result from the operation of this cause—to which we shall more particularly refer—are by no means the only features which fix our attention in this direction.

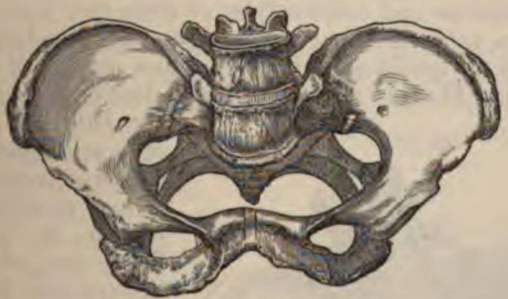
Rachitis or Rickets is, as we have said, a disease of infancy and childhood, which very rarely comes on after the age of puberty. It is attended from the first by a marked cachexia, which the best authorities seem to regard as identical with that of scrofula; but the first symptom which clearly points to the nature of the case, is the yielding of the bones, which soon gives rise to more or less of deformity in those parts of the skeleton which have most to do with the support of the body—namely, the spine, pelvis, and lower limbs. The chief morbid alteration upon which these phenomena depend is a diminution of the earthy constituents of the bones; but the change goes much further than this, and involves corresponding alterations in the animal portion, and thinning of the dense or laminated texture, with a consequent predominance of the cancellated structure, and the formation of certain new and semisolid products. Some bones suffer more than others, and even some parts of the same bone may be affected to a comparatively greater extent. The amount of deformity which is thus produced will obviously depend, in a great measure, upon the extent to which the disease exists, and the continuance of the morbid conditions referred to; but it is generally observed that the deformity is not confined to any particular part of the osseous framework, but affects it generally, the more conspicuous symptoms being spinal curvature and flexion of the bones of the leg. With the distortion in these regions we have here nothing particular to do; but, as regards the pelvis, there is almost always more or less deformity caused by the weight of the trunk, which is thrown upon the bones of the pelvis from the spinal column through the sacrum. Another important point of special interest to us is that rachitis is usually accompanied with arrest of growth, which, although most marked in the lower limbs, and thus imparting dwarfishness to the frame, is also to be noticed in the pelvis, which is often, on this account, abnormal in respect of size as well as of distortion. We shall not further follow the symptoms and progress of such cases. It will suffice to observe that the general tendency is towards recovery, which is first indicated by an amendment of the general health, disappearance of the cachectic symptoms; and, with more inclination for muscular action, a steady amelioration in the morbid condition of the bones, in which the phosphatic deficiency is gradually improved. Ultimately, the health and strength are permanently restored, but the period of restoration merely fixes the bones for life in the distorted position. Judicious treatment during the period of convalescence no doubt often modifies the amount of ultimate deformity; but such treatment is usually directed to the spine and lower limbs, while the pelvis comes in for a much smaller share of attention. The accoucheur should always remember that the existence of spinal curvature is no evidence of antecedent rickets, a consideration which may be of importance, chiefly with reference to questions of prognosis.

Malacosteon, or Osteomalacia, is much rarer than the preceding, and is essentially a disease of adult life. The process of ossification has, we may suppose, been satisfactorily accomplished; and then come on, for the first time, the morbid conditions upon which the distortion depends. Although in this case, as in that of rickets, the most usual occurrence is a disproportion between the earthy and animal constituents of the bones, their whole structure suffers considerable alteration. It is more frequently observed in females than in males; while in rickets there does not seem to be any preference for sex. The general symptoms which accompany malacosteon are, from an early period of the case, very grave. It usually runs a rapid course, manifests no tendency to repair, defies all attempts at treatment, and, sooner or later, has a fatal result. The disease may affect the whole skeleton, or may be limited to several bones, or to one; and it would appear that the pelvis at least rarely escapes. It would also seem to involve the entire texture of the affected bones more equably than rickets. Softening of the bones is the usual characteristic, but it may occasionally be attended with brittleness, to which the term Fragilitas Ossium has been applied. Mollities Ossium is not, therefore, to be accepted as absolutely synonymous with Malacosteon.

In contrasting these two morbid conditions, the first point of importance to be noticed is that, in rickets, we are dealing, not with disease, but with the effects of disease, the pelvis being, in fact, often more dense in structure than if it never had occurred; while, in malacosteon, we have actually existing and progressive disease. From this arises a practical point, which may be noticed here, although with no intention to exaggerate its importance. This is the possibility of some yielding of the bones of the diseased pelvis, so as to admit of parturition, or of operative assistance which would otherwise be unavailable. A case of this kind is given by Osiander, who, being about to perform the Cæsarian section in a malacosteon pelvis, made a final attempt by the hand—an attempt which, owing to such relaxation as is here described, actually succeeded.

The condition and circumstances of the patient at the period of the occurrence are such as to exercise a very important influence on the nature of the distortion. Rickets, in most cases, comes on before the child had begun to walk, so that the most likely mechanism of distortion in these instances is a force acting through the spinal column, as we have already observed, upon a pelvis which, in comparison with the adult model, has a greater inclination and a conjugate diameter exceeding the transverse. In malacosteon, on the other hand, the patient may walk or stand during the process of softening, and the weight of the whole trunk is thus transmitted to the heads of the thigh bones. This difference in the nature of the forces or mechanism of pelvic deformity is well shown in the characteristic features of rachitic and malacosteon pelves. In a typical case of the former variety there is,

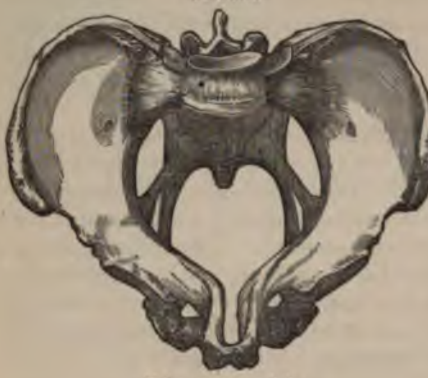
FIG. 135.



Rachitic pelvis.

as shown in Fig. 135, a marked projection forwards of the sacrum by the operation of the cause above alluded to. This is by far the most frequent of all the varieties of deformity which have been described. It may (as shown in the figure) or may not be associated with flattening of the anterior wall, and projection backwards of the symphysis pubis, but the effect, in every case, is a more or less marked diminution of the conjugate diameter of the brim. Different varieties of this distortion have been described as "masculine," "heart-shaped," and "figure of eight" deformities of the brim; all of which are, as will be observed, mere modifications of the same condition, and all of which partake of the character of *elliptical* distortion. In malacosteon again, the general characteristic of the deformity is *angular*, and is due to antero-lateral displacement of the pelvic walls by pressure exercised upon the acetabula. This is indicated in a typical form by the rostrated variety shown in Fig. 136, where the conjugate diameter is increased at the expense of the transverse and oblique.

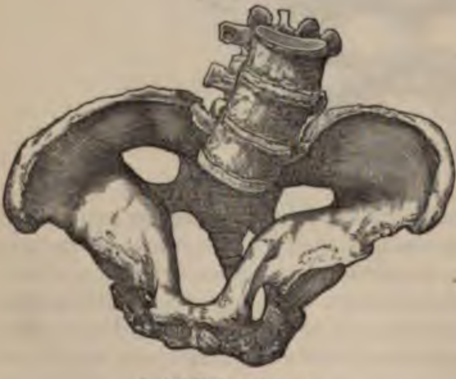
FIG. 136.



Malacosteon pelvis.

Endless varieties and combinations of these two may occur, so that the distinction between a rickety and a malacosteon pelvis is only to be accepted with the qualification that some cases partake of the characteristics of each. Thus, in the case of Isabel Redman, operated upon by Dr. Hall, the conjugate and oblique diameters were both involved, constituting a very serious modification of distortion in this situation. These are, of course, mere illustrations of possible variations, which might be infinitely multiplied; but it is to be remembered that a considerable number of cases have been met with in which an undoubtedly rickety pelvis presented all the more prominent characteristics of malacosteon deformity.

FIG. 137.

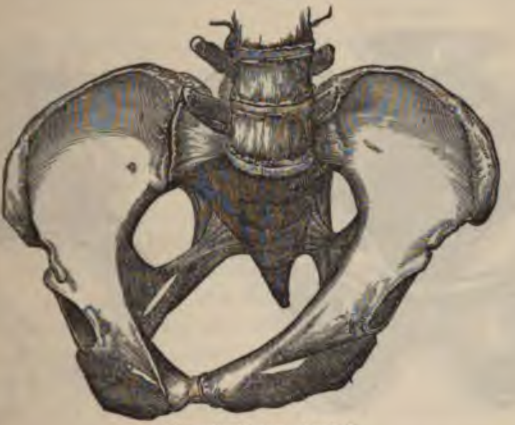


Isabel Redman's case.

In so far as the true malacosteon pelvis is concerned, it has been well observed by Stanley that there is no diminution in the actual circumferential measurement of the brim, and that the bones are of their natural bulk and proportion, so that "if their various doublings were unfolded" the pelvis would be restored to its normal dimensions and form. In rickets, however, this does not usually apply, owing, as has already been observed, to the partial arrest of development which obtains during the course of the disease.

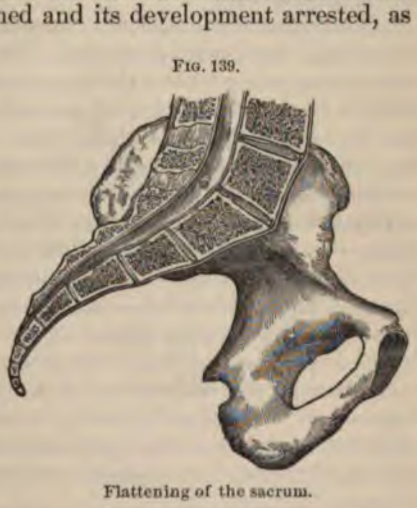
In the majority of cases of pelvic deformity, there is a want of symmetry, one side being affected to a greater extent than the other. This is due to a variety of causes, probably one of the most important being the alteration of the centre of gravity in consequence of spinal curvature. A very peculiar and extreme variety of this kind is that which was so fully described by Naegele in his memoir on the subject as the "*pelvis obliquê-ovata*" or Obliquely Distorted Pelvis. In these very interesting cases, there is anchylosis of the sacro-iliac articulation on the affected side, which is flattened and its development arrested, as shown in the figure. Half of the sacrum is imperfectly developed, and the oblique distortion is such that the whole of that bone is carried towards the affected side, while the sacro-iliac synchondrosis of the sound side is brought nearly opposite to the pubic symphysis.

FIG. 138.



Obliquely distorted pelvis.

FIG. 139.

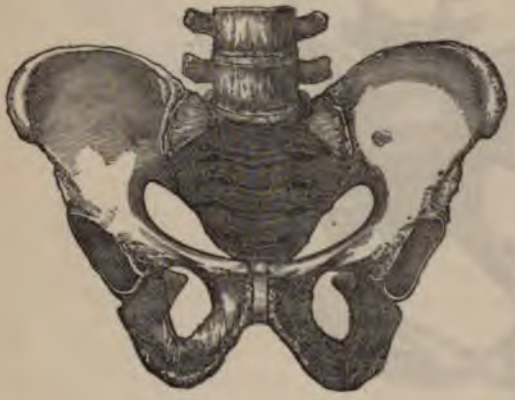


Flattening of the sacrum.

Deformities of the cavity of the pelvis may either be associated with some of the above, or may exist independently. One of the best known of these, and which is by no means an uncommon cause of impaction of the head within the cavity, is "flattening" of the sacrum, as here shown. The normal recession of that bone being wanting, the conjugate diameter of the cavity is proportionally curtailed, and the movement of rotation rendered impossible.

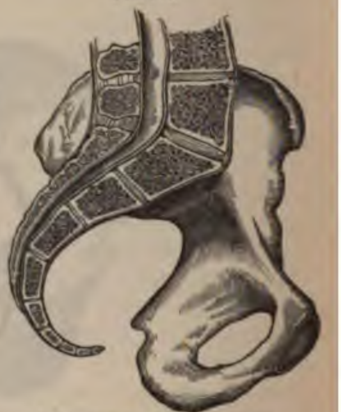
In other cases, the diameters of the pelvis are diminished from above downwards, so as to constitute what has been designated and described as the "funnel-shaped" pelvis. An example of this, from an original drawing of such a case, is shown in Fig. 140, in which the gradual approximation of the ischial planes is greatly exaggerated, and the flattening of the sacrum contributes to the reduction of the conjugate diameter. Sometimes the curve of the sacrum is too great or too abrupt, as in the case represented in Fig. 141. This, however, might perhaps be supposed to come more within the category of distortion of the outlet, although it may, we apprehend, be fairly considered as contributing to both.

FIG. 140.



Funnel-shaped pelvis.

FIG. 141.



Exaggerated sacral curvature.

Distortion of the outlet is necessarily involved in many of the varieties which have been described. The general effects produced in malacosteon are, as we have shown, a narrowing of the transverse diameter, chiefly by approximation of the acetabula. This implies, as a reference to Fig. 136 will more clearly show, a diminution of the corresponding diameters of the cavity and outlet, which brings the tuberosities of the ischia nearer to each other, and thus reduces the subpubic angle, so that the head must descend further in the direction of the perineum, before it can pass under the subpubic arch. And, in like manner, a diminution of the conjugate diameter at the outlet will materially impede the birth of the head. An abrupt curve of the sacrum, as shown in the accompanying figure, will have this effect, and if there should be, as has been observed, anchylosis of the sacro-coccygeal articulation, the difficulties of the case will thereby be materially increased. When the deformity is confined to this part of the pelvis, it has been observed that approximation of the ischial tuberosities is quite as frequent as conjugate contraction.[1]

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[1] For an exhaustive account of the difference between malacosteon and rickety pelvis, embodying the researches of Meyer of Zurich, see an article by Dr. Matthews Duncan in the *Edinburgh Medical Journal* for April, 1856.

The masculine type of pelvis has already been mentioned in reference to the deformities which exist at the brim. An extension of this to the cavity and outlet constitutes a very serious impediment to labor. In such cases we may have the bones of the pelvis thicker, heavier, and more marked with muscular attachments, the cavity deeper—as is more particularly shown by the greater depth of the pubic symphysis—and the subpubic angle rendered more acute by an approximation of the ischial tuberosities. Or again, we may have an infantile type of pelvis, in which, from arrest of development, with or without rickets in other parts, the inclination of the brim is greater, and the transverse diameter relatively less than is normal, while the whole pelvis is smaller than it should be.

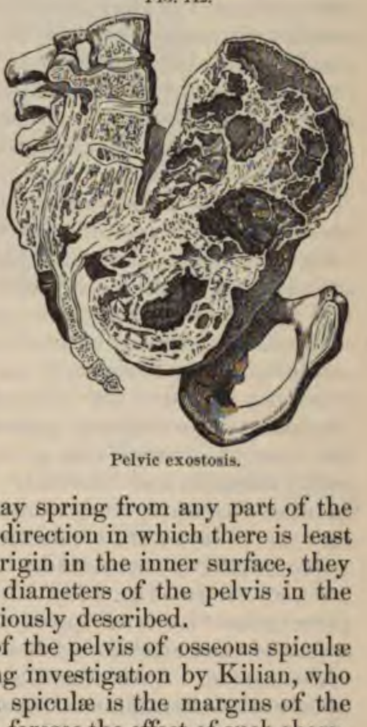
It is a fact familiar to every surgeon that the action of the muscles plays a most important part in producing distortion of a rickety skeleton; but it would appear that this cause of pelvic deformity has not received anything like general attention at the hands of obstetric writers. The following observations on this point are borrowed from Dr. Murphy: "In the motions of the body there are two sets of muscles connected with the pelvis to be considered, each having a distinct office to perform. One set, passing, anteriorly and posteriorly, between the pelvis and the thigh bones, keeps the pelvis fixed to its position; these, therefore, would act very powerfully in distorting the softened bone to which they are attached, but would manifestly produce a much greater effect when the body is upright and the pelvis is made a centre of motion, as in the adult pelvis, than when the body is bent forwards, and moves less upon the pelvis, as in the child. Such we find to be the case: the lower portion of the sacrum and the coccyx are bent, nearly at a right angle, by the great gluteal and pyramidal muscles, and close up the outlet. Anteriorly the effect is not so apparent in the adult pelvis, because it is counteracted by the acetabula and ischio-pubic rami being pressed in towards the centre; but still the edges of these rami are more everted, and the pubic arch itself, immediately beneath the symphysis, is wider than it ought to be. The other set of muscles are those that maintain the body in its erect position; posteriorly the dorsal; and anteriorly, the abdominal muscles. The tendency of the former is to draw the sacrum towards the spine, and thus to increase the projection of the promontory; the effect of the latter is to draw the ilium more upright, and to render it more irregular. The action of these muscles will therefore explain the character of some of the distortions in the adult pelvis. In the infant pelvis their influence is modified by the altered position of the body. In this case the weight from above presses down upon the thigh bones, and tends to separate them more from each other; the muscles, therefore, passing between them and the pelvis, will draw outwards that portion of the pelvis to which they are attached; hence the ischio-pubic rami are more separated, and the tubera of the ischia more apart than natural; but the distance of the thigh bone being increased, the coccyx can still be drawn forwards by the muscles attached to it; consequently the outlet is much more open than it ought to be, and the abruptly curved sacrum becomes the only impediment to the escape of the head."

It will be understood that the varieties of pelvic deformity above described are far from embracing all that might be adduced, as our object has been to avoid complication by simplifying the subject as far as is consistent with a correct appreciation of the facts which may be supposed to bear upon practice. Some of the rarer deformities are figured in Moreau's atlas. There are still, however, one or two conditions, which, although not strictly pelvic deformities, are very properly considered along with them. Among these we may first mention deformity due to disease of the lower portion of the spinal column, in which curvature or other displacement of the bones may prove as effectual a bar to natural delivery as the more common varieties of deformity at the brim. Of this nature is the affection which has been described under the name of Spondylolisthesis, when the last lumbar vertebra slips downwards and forwards and directly encroaches on the conjugate of the brim.

Nor can we omit to mention two other varieties of peculiarity in conformation, in each of which the shape of the pelvis and relative measurements of its parts are perfectly normal. The former of these, which has been termed the *pelvis æquabiliter-justo-major*, implies a pelvis which is symmetrically increased in all its diameters. Although such a conformation as this must necessarily act by facilitating labor, by the comparative ease with which it admits of the passage of the child, it is not to be regarded as a favorable condition. On the contrary, precipitate labor is always, and with good reason, looked upon with apprehension, as experience teaches us that, when moderate and normal resistance on the part of the pelvic walls is wanting, violent and rapid dilatation of the soft textures of the canal necessarily takes place, to the danger of their integrity at any part from the os uteri to the vulva; and there are, in addition to this, other dangers, which will afterwards be more particularly described. The only advantage which may accrue from such a pelvis occurs, according to Churchill, in face presentations. To this we may perhaps add occipito-posterior positions of the cranium, and, in the absence of all assistance, transverse presentations, as it would naturally favor spontaneous expulsion or evolution. The *pelvis æquabiliter-justo-minor*—the other variety referred to—is the converse of this. We have here also a perfectly-shaped pelvis; but all the diameters are less than is usual, so that a special impediment must in every such case exist, in a degree proportionate to the extent of the symmetrical deformity. What makes this a condition more unfavorable than we might at first suppose, is the absence of any possible compensation in one direction for a deformity existing in another. We thus find that the moulding process is of much less avail here than where, for example, we have a moderate degree of conjugate contraction, with an ample measurement in the transverse, in which latter direction the head may, by compression, elongate itself, and thus, by changing its shape, pass the obstacle, after a certain amount of delay.

We may here consider the effect which is produced by certain surgical diseases or accidents which may prove impediments, more or less insuperable, to normal parturition. These are in their nature various, and, in their extent, offer every variety from a slight encroachment upon a single diameter to complete blocking up of the true pelvis. Osteo-sarcoma and Exostosis are two of the most important of these affections, and may constitute, if of any size, an impediment which renders delivery by the natural channel quite impossible. These tumors may take their origin from any part of the osseous tissue of the pelvis; but the situation from which they most frequently spring is the upper third of the sacrum, encroaching therefore upon the brim and cavity by spreading from this centre. Care must be taken, by examination through the vagina, and, if necessary, through the rectum, not to mistake these for abnormal contraction of the brim, due to projection of the sacral promontory. This is an error which has been committed, and which would probably be in most cases avoided by external measurement of the pelvis; and, if it should, in the course of such an examination, be discovered that the measurements in question were normal in extent, the presumption of exostosis would be increased. The absolute hopelessness, in the case of an exostosis of large size, of delivering by the vagina will appear by a reference to this familiar figure.

FIG. 142.



Pelvic exostosis.

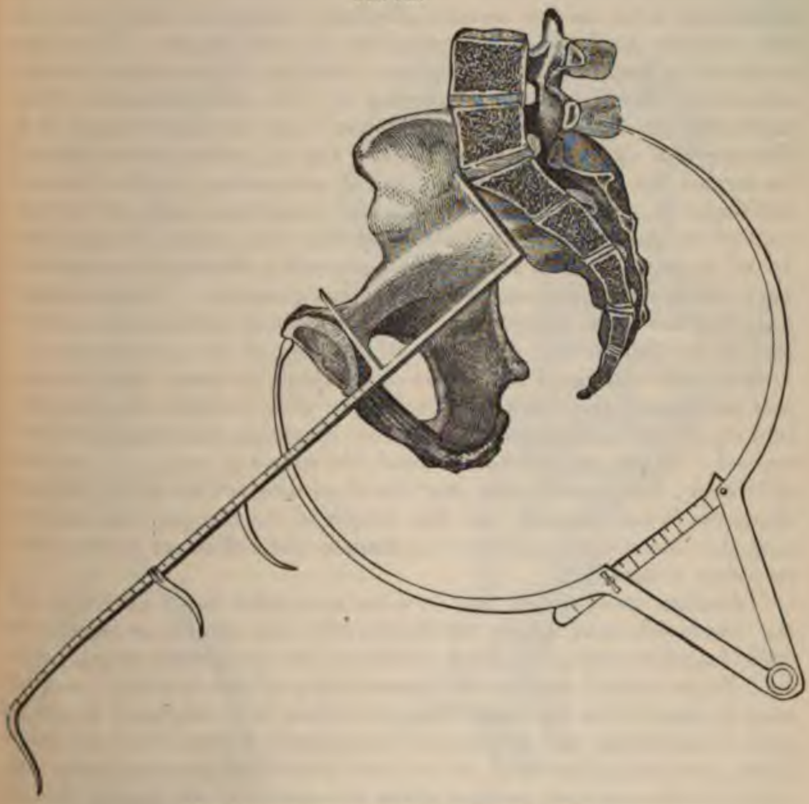
Cancerous disease of the pelvic bones, resulting in the development of tumors of greater or less consistency, may be a serious mechanical impediment to the course of labor, besides being a condition which involves the life of the mother. These may spring from any part of the pelvis, and will probably develop in the direction in which there is least resistance, so that, if they have their origin in the inner surface, they can scarcely fail seriously to reduce the diameters of the pelvis in the same manner as the benign tumors previously described.

The projection from certain portions of the pelvis of osseous spiculæ was made the subject of very painstaking investigation by Kilian, who found that a common situation of such spiculæ is the margins of the various symphyses. It is not difficult to foresee the effect of such sharp, thornlike projections if they should chance to spring from the sacro-iliac synchondrosis, or from any other part of the brim of the pelvis; and indeed, in such cases—which are fortunately very rare—scarcely anything could be looked for but laceration of the uterus and consequent rupture. It would appear to be a general belief that bony growths from the pelvis are in some way associated with the gouty or rheumatic diathesis. Partial ossification of the sacro-sciatic ligaments has been sometimes observed, and, when this takes place, the peculiarity would, no doubt, be suggestive of the natural condition in some of the lower animals. From these, from the other ligamentous structures, and from the periosteum, tumors of the fibrous or fibro-sarcomatous variety may spring, which, when constituting an apparent deformity in the pelvis, have sometimes been successfully removed in the course of labor. Any attempt at the removal of the purely bony tumors is out of the question, but cases have occurred in which the texture of these tumors was so loose, and so entirely composed of weak, cancellated structure as to admit of being crushed or broken down, either by the fœtal head or the manipulations of the accoucheur.

Fractures of the pelvis are occasional causes of pelvic deformity, either from the union of the fractured bones in a distorted position, or from the irregular development of callus in the direction of the pelvic cavity, the diameters being thereby reduced. Projections of this kind have been observed, in which the pelvic diameters involved were reduced to the extent of one and even two inches. Very considerable deformity of the pelvis may also be the result of Morbus Coxarius, which has gone on to dislocation and anchylosis; or of fracture or dislocation of the head of the bone—the effect being due, in such cases, to the distorted condition of the limb acting, in all probability, on a pelvis which is morbidly softened, or at least in a constitution which is impaired.

Symptoms.—These may, to a great extent, be inferred from what has been said in reference to the causes from which pelvic deformities are believed to arise. In marked cases, involving considerable deformity—such as may be due to Rachitis—the general distortion of the skeleton will point to the pelvis as a part of the solid framework of the body which can hardly be expected to have escaped. But an obvious rickety condition of the skeleton is no evidence whatever, either of the degree or of the nature of the deformity. It is necessary, therefore, in such instances, if we desire to gain an accurate knowledge of the nature of the case, to observe with great care the actual pelvic measurements, both externally and internally. The conjugate diameter is that which, in most instances, we are anxious to determine, and, in so far as this may be inferred from measurement in the living subject, it may be approximately ascertained by the use of Baudelocque's Calipers, which are here shown (Fig. 143). By this, and making a deduction of about three inches for the soft parts, the measurement from the posterior sacral spines to the anterior surface of the pubic symphysis should be about seven inches. Such a method of examination as this is so manifestly open to the operation of disturbing causes, that little reliance can be placed on inferences which are drawn from it alone, so that various instruments have been devised, and a great amount of mechanical ingenuity has been expended, on the construction of an internal pelvimeter. One of the earliest instruments of this kind was the pelvimeter of Coutouly, which closely resembles in its form the rule used by shoemakers in measuring the length of the foot; and consists of two parts, one of which slides in a groove in the other. A limb projects from the extremity of each of these at right angles to it. The instrument is introduced beneath the arch of the pubis, and pushed onwards until the extremity touches the sacral promontory. It is held in this position, and the pubic portion is then slid forwards until it touches the internal surface of the pubic symphysis. The distance of the sacrum from the pubic bones is indicated by the extent to which the anterior portion is thus drawn out, which is read off in inches marked on the stem. The total length of this instrument, which is also represented in Fig. 143, is about eleven inches.

FIG. 143.



Baudelocque's calipers and Coutouly's pelvimeter.

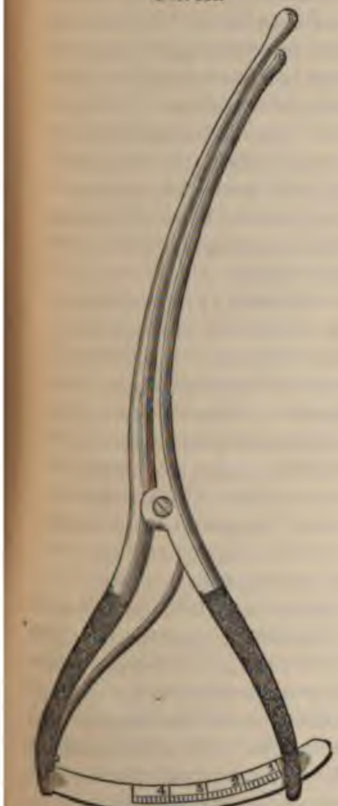
An immense number of pelvimeters have since then been invented. That figured on p. 443 (Fig. 144), designed by Dr. Lumley Earle, is probably one of the best and simplest; it is to be introduced into the vagina with the shorter of the two limbs turned towards the pubis; and, on the extremity reaching the level of the brim, as ascertained by the finger, along which it is carefully guided, the handles are pressed together, and their divergence read off on the scale which is between them. The objection to all such internal instruments is, that they are difficult of application so as to insure accurate results, and besides not altogether safe unless used with great caution. Coutouly's is, for reasons which are quite obvious, inapplicable to cases in which the woman is in labor, and, indeed, to cases of pregnancy, so that in the very instances in which we are most anxious for exact information, it is practically valueless. Dr. Earle's is, no doubt, from this point of view to be preferred. But even when, in the absence of pregnancy, we may wish to ascertain the condition of the pelvis, it is by no means an easy matter to use either the one or the other.

All such contrivances, indeed, as have hitherto been invented are open to the objections which have just been stated. Many of the best authorities have, on this account, absolutely discarded them, and prefer the simpler method of investigation by the finger. The various methods by means of which we may thus gain information have been admirably described and illustrated by Dr. Ramsbotham. "Three methods," he says, "are practiced; one is, by the introduction of the first finger of the right hand within the vagina, so that the point should be carried up to, and touch the sacral promontory, while the root of the finger is applied exactly under the symphysis pubis, at the upper part of the arch. It must be evident that this mode of inquiry will be of no avail unless the pelvis be greatly distorted—considerably under three inches, indeed, in the conjugate diameter. For the ordinary length of the index finger along its inner edge is less than three inches; and as the oblique line from the promontory to the apex of the pubic arch exceeds the direct line across, so if there be more than the space just mentioned, the finger would not be able to reach the projection, and we should consequently be in utter ignorance what amount of room existed. If the pelvis be very small, the sacral promontory can be felt with ease; but, even in that case, the dimensions of the direct conjugate diameter is not afforded, but the length of the oblique line is given; and it is not always possible to calculate the difference between these two lines accurately.

"Another mode which has been recommended is the introduction of the whole left hand within the pelvis, with the outside or point of the little finger touching the inner surface of the symphysis pubis, and the first finger placed against the promontory of the sacrum. As every man is aware what his hand measures across, it is supposed he will be able to ascertain the transverse (conjugate?) diameter of the pelvis. Thus, presuming the hand to be two inches and three-quarters wide, which is the common average about the centre of the fingers, if, when placed edgeways, it just fits the brim, the examiner will know that the space is within three inches. Again, if he can only introduce three fingers instead of four, he will know that the pelvis does not measure two inches, and, probably, not so much; and, if he can only pass up two fingers, closed together, he will be assured that there is not more than an inch and three-eighths. But, on the contrary, if, in introducing the whole hand, he be compelled to spread his fingers widely before he can touch the sacral promontory, he will then be certain that the space is more than three inches, probably four, or near it. But it is not always easy to follow this mode of inquiry, because the child's head is generally protruded somewhat into the pelvis, even when the brim is contracted; and we could not carry the hand up in this manner, and make the accurate examination which we require to do, unless the brim as well as the cavity were perfectly free and unoccupied. It might, perhaps, be employed with advantage, provided the deformity was excessive.

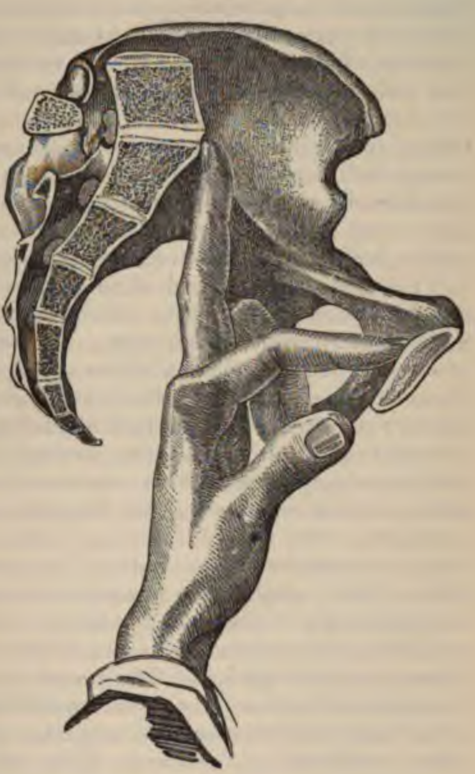
"The third method I consider the best, and is the one I myself adopt. Two fingers of the left hand are to be carried within the vagina; the extremity of the first finger is to be placed exactly behind the symphysis pubis, and the tip of the second against the sacral promontory. (See Fig. 145.) By stretching the fingers in this way, we shall have little difficulty in reaching the promontory of the sacrum, even when the pelvis is of ordinary dimensions; and by withdrawing them in the same position, we may measure off the distance between their extremities on the first finger of the right hand, or on a scale of inches, or with the limbs of a pair of compasses; and, consequently, we arrive at an accurate knowledge of the great dimensions of the pelvic brim. The laxity of the vagina, and other soft structures, which almost invariably attends the process of labor, will permit the fingers to be withdrawn while extended; and if the examiner uses sufficient care, they may be kept perfectly steady until the space which they embrace be ascertained. This mode of proceeding possesses a great advantage over the other two, inasmuch as we are able equally well to make our

FIG. 144.



Lumley Earle's pelvimeter.

FIG. 145.



Manual pelvimetry.

examination, whether the head be occupying a part of the pelvic cavity, or whether it be still detained quite above the brim; for, even if it be engaged in the vagina, one finger may be passed anterior to, and the other behind it, with comparative ease."

It is only, however, after considerable experience that such arbitrary methods of examination are of much value in diagnosis. Very marked deformity is usually recognized easily enough, but the more important question of the degree or amount of distortion is not so readily solved, and will always require most careful and exact observation. It is upon the latter, indeed, that the most important practical considerations hinge; and upon the result of such an investigation, be it right or wrong, will depend whether, in a given case, we determine in favor of operation by the forceps, turning, craniotomy, or the Cæsarian Section. The actual measurements which relate to these operations will be more particularly considered in the chapters which follow.

The effects, direct and indirect, of pelvic deformity, are often very serious, and are usually to be observed, as might be anticipated, in neglected or mismanaged cases. A common result of long-continued pressure upon the tissues of the os and cervix is sloughing of these parts, attended with irritative fever, and general symptoms even more severe than this. The destruction of tissue which is involved in this process may result in fistulous openings into the bladder or rectum, requiring subsequent operative procedure for their cure. The deformities are, as is universally admitted, frequent causes of rupture of the uterus, sometimes from actual bursting violence of the pains, and, in other cases, by pressure of the walls of the uterus against some part of the brim of the pelvis. The great amount of pressure which is exercised in these cases is occasionally shown in a significant manner by the moulding and alteration in shape of the child's head. This sometimes presents an indentation of the parietal bone from the pressure of a projecting sacral promontory; and, under the influence of the same cause, even fracture of the parietal bone has taken place. Another marked effect, produced by the arrest of the child's head or other presenting part, is the formation of a caput succedaneum of very unusual size, in the observation of which a serious error may arise. The formation of this swelling is a process of gradual development in the direction of the vagina, and not of sudden growth; it may, therefore, happen, that an inexperienced person, who feels that the actual surface of the scalp approaches nearer and nearer to the finger, may take this as evidence of a gradual advance of the head, the passage of which may nevertheless be absolutely barred. If, in consequence of this or any similar error in judgment, the case is left too long to nature, the powers of the woman progressively decline, and she soon reaches a condition in which we act at a great disadvantage, and even with much apprehension as to the ultimate result.

In cases of extreme deformity, the head does not even engage in the brim, so that the effect of the ordinary expulsive efforts is simply to pinch or compress the lower segment of the uterus against the pelvic walls, while the os is being slowly dilated by the bag of waters. When the deformity is confined to the brim, and the promontory is not within reach of the finger, the nature of such a case is probably sometimes overlooked at first, as the examiner may conclude, from a simple exploration of the vagina by one finger, that everything is quite normal and that the presenting part will descend presently. In other instances, the obstruction being less in degree, the vault of the cranium passes the plane of the brim, and the head is only arrested when its principal diameters come to be involved; and, in a third class of cases, the obstacle being in the cavity or even at the outlet, labor goes on quite naturally until the head reaches the particular plane at which the obstruction exists.

There is one point, in reference to these cases, in which it is of much importance that we should ascertain the relative condition of the parts involved: this is best expressed by drawing a careful distinction between the terms "impaction" and "arrest," which are sometimes used somewhat loosely, as if the expressions were synonymous. By impaction, we should imply only such a condition of the head as consists in its being actually jammed in the pelvis. In such a case, not only does the head make no advance with the pains, but it does not recede during the interval, so that it is immovable in both directions. In a case in which the head is only arrested, however, there may be an equal impossibility as regards the advance of the head, but its recession during the interval between the pains shows that the period of impaction has not yet been reached—a point which may be of very considerable importance in regard to the probable success or failure of a given operation.

Treatment.—The management of cases of pelvic deformity will be treated of in detail when, in the subsequent chapters, the various operations are considered, the necessity for which arises in a great measure from this particular cause. The accoucheur is occasionally consulted in reference to such cases, at a time when the dangers of pelvic distortion may be averted or modified. If it is a question as to marriage, it may be a very difficult as well as a delicate matter to decide, in a rachitic patient, between celibacy and the possible dangers of pregnancy; but, if the case should be put before us, we must simply advise according to the facts revealed in the course of a thorough examination, when, if there should be evidence of such distortion as would probably call for the operation of craniotomy, it will be proper to withhold our sanction to a marriage under such circumstances. Another possible case, in which prevention rather than treatment may require consideration, is when the woman is pregnant, and the evidence of extreme distortion is clear; or when, in previous pregnancies, labor has only been terminated by the sacrifice of the child. In both of these instances, the question which arises is that of the induction of premature labor, by which alone, it may be, the safety of the mother can be insured. It is generally, however, in the course of labor at the full time that the nature of the case is disclosed, and prompt and decisive treatment called for.

Having endeavored to ascertain, approximately at least, the amount of distortion, we must, in the first instance, decide whether, and if so, to what extent, we should give nature a chance. In the minor degrees of pelvic deformity, it is always proper to do so, if the strength of the patient be not exhausted, and the uterine effort not unduly violent. When the cranium is of moderate size, it frequently occurs that, even in unpromising circumstances, the head becomes so moulded as to pass with perfect safety both to mother and child, although probably after a tedious labor. If the head is not actually impacted, we may have the choice of three operations—the forceps, turning, or craniotomy; but when impaction has taken place, it is impossible to pass the hand, and, therefore, turning is struck out of our calculations altogether. In every case in which the head is in the cavity or at the outlet, the forceps should be preferred, unless, indeed, there is clear evidence that the head cannot pass without a reduction of its bulk, when any attempt of this kind would be worse than useless. If, however, the head should be at the brim, the use of the long forceps involves other and more serious considerations, and is, indeed, generally regarded as an operation so dangerous that not a few of the most distinguished of modern obstetricians have expressed a decided preference for turning over the forceps, and even, under certain circumstances, for turning as compared with craniotomy when the head is in this particular situation. The general rules which are laid down for our guidance in the application of the forceps in ordinary cases are, to a limited extent only, of avail here. The altered conditions of a deformed pelvis, differing more or less in every case, put such rules as serve for the normal pelvis completely out of the question. Instead, for example, of applying the blades to the sides of the head, it is often necessary to apply them to the forehead and occiput, and, in general terms, it may be said that our duty is to apply them in the direction where we have most room, and where we can get the firmest grip of the cranium. Thus, if the head is arrested at the upper portion of the cavity, in consequence of projection of the sacral promontory, the sides of the head will probably be strongly compressed in the reduced conjugate diameter. The insertion of the blades of the forceps in such a direction would, therefore, be practically a matter of great difficulty, if not impossibility; so that the operator should at once, and without hesitation, apply the blades to the long diameter of the head in the transverse of the brim.

If the head is at the brim, and the distortion not excessive, it will be quite proper, as we conceive, to make a gentle attempt by the long double-curved forceps, which should be of considerable strength in construction, in order to gain an efficient hold, and to prevent slipping. The operator, bearing in mind the immense power of such an instrument, will be excessively cautious in the amount of force which he employs, and will only persist if he observes some indication of yielding.

Putting, for the moment, out of the question what have been called long-forceps cases, there are few points, of undoubted practical importance, in reference to which greater difference of opinion obtains, than with regard to the proportion of cases in which we are justified in applying the forceps in the minor degrees of pelvic disproportion. When we find one practitioner of experience using it only once in a hundred or even in several hundred cases, and another, of equal experience, in every eighth or ninth case, it is by no means easy to decide who is in the right. For our part, we entertain a very confident belief that the practitioner who uses the forceps in less than four per cent. of all his cases exposes many of his patients to needless pain and increased risk, and is pretty sure, in his practice, to lose more children in labor than he ought.

When the decision lies between turning and craniotomy, we must first be sure that, if we succeed in turning, the head can be got through the contraction; for it sometimes happens that, after turning, delivery can only be accomplished by perforating behind the ear. It must, therefore, be obvious, that it would be better to perforate and deliver at once, than to turn and then perforate, thereby subjecting the woman to a twofold danger. We must also be able to displace the presenting part without employing much force, so as to introduce the hand into the uterus; and it is certain that, when this cannot be done without violence, it is better at once to desist. One of the most important bearings of this interesting subject is whether the child is alive or not, which may be ascertained by the stethoscope in the usual way. If it is so, the possibility of saving the child,—which has sometimes been done when the general condition seemed little to encourage the hope of such a favorable result,—is the strongest possible inducement we can have for choosing turning, which, at least, gives the child the chance, small though it may be, of which craniotomy necessarily deprives it.

Among the minor arguments which have been used in support of this procedure, may be mentioned the repugnance with which one naturally regards any operation which involves the mutilation of the child, and the use of instruments instead of the hand. And, again, as has very clearly been pointed out by Simpson, there is an undoubted advantage in the manner in which "the transit of the cone-shaped head of the child, through a somewhat narrow brim, is facilitated by the narrow end of the cone (or bi-mastoid diameter of the head) being made to enter and engage first in the contracted brim; and the hold which we obtain of the extracted body of the child enables us to employ so much extractive force upon the engaged fœtal head, as to make the elastic sides of the upper and broader portion of the cone (or bi-parietal diameter of the cranium) to become compressed, and if necessary indented, between the sides of the contracted brim." Besides, the operation of turning, when it can be effected, even after some time, and with some difficulty, is, there is good reason to believe, more safe to the life of the mother than that of craniotomy; so that, even when the child is dead, it is often to be preferred. But, when the child is dead, and turning is unusually difficult or impracticable, we must consent to waive the objections which have just been stated, and substitute craniotomy without delay. This, then, is a question of great practical importance, and is still receiving at the hands of the ablest obstetricians the attention which it merits; but the limits of this work preclude a more extended analysis of the facts which bear upon the subject.

When the pelvic distortion is excessive, and more than one of the diameters is encroached upon to a great extent, as has frequently been observed in malacosteon pelves, it may be quite impossible to deliver the woman by means of any of the operations which we have mentioned. We may, in such instances, have no resource but the desperate one of the Cæsarian section. What specific conditions may be held to justify the performance of that particular operation, we shall afterwards attempt to show; but, in regard to it, as well as the other methods of operative procedure, it is wellnigh impossible to lay down hard-and-fast rules, which may seem, in any strict sense, reliable, as for our guidance. An attempt will, however, be made to state the measurements, and other conditions, which are held, by the most competent authorities, to be warrant for the preference of one operation over another.

The above remarks have had reference to cranial presentations only; but it is, of course, to be kept in view that any other presentation may occur, and thus develop new and special considerations. An intelligent combination of the general principles upon which such presentations are to be managed, and an adaptation of these to the special circumstances of the case, will enable the well-informed practitioner to conduct such cases also in a skilful and creditable manner.

CHAPTER XXVIII.

THE FORCEPS.

HISTORY OF THE FORCEPS—CHAMBERLEN'S FORCEPS—INVENTION OF THE PELVIC CURVE—THE SHORT FORCEPS: CASES TO WHICH IT IS APPLICABLE—REASONS FOR PREFERRING THE STRAIGHT FORCEPS IN MOST CASES—CIRCUMSTANCES IN WHICH THE FORCEPS IS REQUIRED—APPLICATION OF THE FORCEPS: CONDITIONS ESSENTIAL TO SAFETY: DEGREE OF DILATATION OF THE OS: IS IT NECESSARY TO FEEL AN EAR? MEMBRANES TO BE RUPTURED: BLADES TO BE APPLIED TO THE SIDES OF THE HEAD: FORCEPS TO BE APPLIED IN THE OPPOSITE OBLIQUE DIAMETER TO THAT OCCUPIED BY THE HEAD OF THE CHILD—THE OPERATION: INTRODUCTION OF THE "LOWER" AND "UPPER" BLADES IN THE FIRST CRANIAL POSITION—APPLICATION TO THE OTHER CRANIAL POSITIONS.

THE subject of operative Midwifery naturally commences by a consideration of the great Prime Mover of Obstetrics, as the Forceps has not inaptly been termed. It is scarcely possible to exaggerate the importance of this instrument, which is simple in construction, easy of application, and marvellous in power; and besides, the greater frequency with which we avail ourselves of its aid, as compared with other methods of instrumental and operative assistance, fully entitles it, and its application to practice, to the prominent position in which the subject is invariably placed.

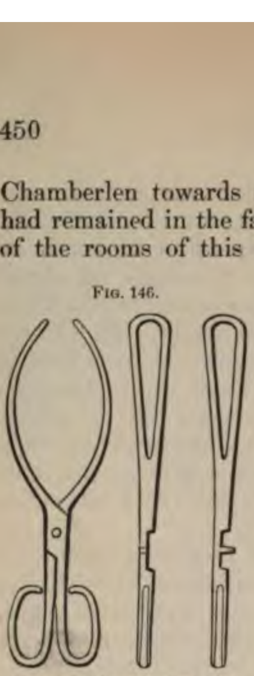
No doubt can be entertained that the ancients discovered, and were in the habit of using, an instrument which, in the principle of its construction, is identical with the modern forceps. The period at which the discovery was actually made will probably never be known. It does not appear that the knowledge of the subject was general, even among the most civilized communities, but it is certain that it was well known to the early Arabian physicians. We thus find it mentioned by Avicenna, and more particularly described by Albucasis, who lived about the eleventh or twelfth century. The latter describes two kinds of forceps, the *misdach* and the *almisdach*, both being, according to the Latin version, circular and full of teeth. It is worthy of note that, in the Arab original, which Smellie seems to have seen in the Bodleian library at Oxford, the *misdach* is described as straight, and the *almisdach* as curved. This important discovery was, however, completely lost sight of in the gloom of the dark ages, nor was it till near the middle of the seventeenth century that it was rediscovered, and, after a long interval of secrecy, introduced into practice.

The discovery was made, as Dr. Churchill has clearly made out, by Dr. Paul Chamberlen prior to 1647, and was communicated by him to his sons, who were also members of the profession. The secret seems, however, to have been greedily guarded by the Chamberlen family for their own profit; and Dr. Hugh Chamberlen, who translated into English Mauriceau's work on Midwifery, alludes to it in the preface to that work as late as 1716. Referring to the use of the crotchet, he says: "But I can neither approve of that practice, nor of those delays, beyond twenty-four hours, because my father, brothers, and myself (though none else in Europe, as I know) have, by God's blessing and our industry, attained to, and long practiced a way to deliver women in this case without any prejudice to them or their infants; though all others (being obliged, for want of such an expedient, to use the common way) do and must endanger, if not destroy, one or both, with hooks." As a sort of apology for keeping it secret, he adds: "There being my father and two brothers living that practice this art, I cannot esteem it my own to dispose of nor publish it without injury to them."

The political troubles of his time obliged Dr. Hugh Chamberlen, on two occasions at least, to fly the country and take refuge on the Continent, where he made various attempts to dispose of his invention. His offer to sell it to the French Government was refused, chiefly on account of the failure which had attended his efforts to deliver a woman upon whom Mauriceau had resolved to perform the Cæsarian operation, and which was therefore a case, as we may assume, quite unsuitable for the operation by the forceps. He was more successful, however, in Holland, where he managed to dispose of his secret to several practitioners, of whom the eminent Ruysch, the anatomist, was one. From the Netherlands to Germany, where it was used by Solingen, and ultimately to France, the secret slowly spread, until it was a secret no longer, and was recognized in all its importance by the most accomplished accoucheurs of the day. Long before the operation had thus made its way into notice on the Continent, the secret in this country had undoubtedly oozed out in some quarter; and, ultimately, the midwifery forceps was described and figured by Chapman, in his well-known work, as the instrument used by the Chamberlens. A very interesting discovery was made in the old manor-house of a small estate near Malden, in Essex, which had been purchased by Dr. Peter

Chamberlen towards the end of the seventeenth century, and which had remained in the family till about 1715. In an old chest in one of the rooms of this house there was discovered, in 1818, a collection of obstetric instruments, along with old coins, trinkets, and the like. Mr. Cansardine, into whose possession these relics had fallen, gave an interesting description of them in the *Medico-Chirurgical Transactions*, vol. ix. There were several pairs of forceps, showing apparently the various stages of advancement through which the invention passed in Chamberlen's hands before he reached what he believed to be perfection. Fig. 146 shows one of the most perfect of these, in which the blades are fenestrated, and are so constructed as, when separately applied, to be articulated together at the shank by means of a pivot. This instrument, as perfected by Giffard and Chapman, is essentially the same as the forceps most frequently used at the present day, except in so far as the lock is concerned.

FIG. 146.



Sketch of Chamberlen's forceps (Rigby).

Up to this time the handles of all the instruments were, as in the French forceps to the present day, of iron, and the lock was either a pivot, with or without a screw; a sort of mortice lock, like the blades of a pair of scissors; or the blades were clumsily tied together, after their adjustment, by means of a tape or cord. We are certainly indebted to Smellie for the simple contrivance which is known as the English lock, and also for the adaptation of wooden handles, which give a much better hold and purchase. The principle upon which all forceps were essentially constructed was to adjust the curve of the blades with reference only to the spheroidal shape of the child's head, so as to make sure of securing an efficient hold without risk to the child. The difficulty in the application of such an instrument as this, when the head was at the brim or at the upper part of the cavity, led to another important modification of the forceps, the credit of which is divided between Levret and Smellie. It is most likely, however, that the French obstetrician was the real inventor; but it is to be regretted, for the sake of his reputation, that he made a secret of it, as the Chamberlens, to their lasting discredit, had done before.

The novelty in question consisted in the adaptation of a second curve in the blades, with reference, in this instance, to the curved axis of the pelvic canal. This is called the "pelvic curve," and is the invariable form of the French forceps of the present day; while, in this country, the straight forceps has been entirely abandoned by some of the most eminent of our obstetrical authorities. This variety was originally constructed in order to overcome difficulties at the brim and high in the cavity, and it is, therefore, to these that it is chiefly applicable; although, as has been said, many prefer this form in all cases, and allege that it is easier in application, and safer both to mother and child. We do not intend to enter at any length upon the controversy of single *versus* double-curved forceps; but it is proper to mention that Dr. Barnes, the latest English authority on the subject of operative midwifery, pronounces, in very emphatic terms, in favor of the latter, in all cases, whether at the brim, in the cavity, or at the outlet. For our part, although we cannot subscribe to this doctrine, we are quite confident as to the superiority of the pelvic curve in all cases where the head is at the brim or high in the cavity.

Long and Short Forceps are described by all English writers as distinct varieties of the instrument, and are sold by the makers under these names. The Short Forceps, as usually constructed, is an instrument about eleven inches in length, the measurement from the lock to the tip of the blades being a little over seven inches. Each blade is fenestrated, the aperture being destined, on each side, to receive the parietal protuberances. The blades are curved, so as to measure between their widest part about three inches, and from tip to tip, when closed, nor more than an inch. This instrument, when made without a pelvic curve, is known as Smellie's forceps, and is still used in this country more frequently than any other form. When it is applied to the child's head within the pelvis, the handles should be about an inch apart. It is scarcely necessary to observe, what is equally applicable to any variety of forceps, that the blades should be made of steel of the finest temper; otherwise, it is constantly apt to slip over the head by yielding of the metal. The edges are highly polished, and bevelled off in every direction with great care, so as to avoid the possibility of injuring the scalp of the child or the soft parts of the mother. Covering the blades with leather was once practiced, but this has now properly fallen into disuse, as rendering the instrument more difficult of introduction, and more likely to convey infection. Nor is the practice of covering them with a composition of gutta-percha to be commended; and, when properly made, the clean, smooth metal is, on all accounts, to be preferred. The short forceps is admirably adapted for the extraction of the head from the outlet and lower part of the pelvis; but if the head is higher in the cavity, the instrument, although it still may be used with difficulty, is not to be recommended when one more suitable is at hand. Its use is limited to those instances (embracing the greater number of cases calling for assistance) in which it is possible, after adjusting the blades, to close them while the lock is still quite clear of the external parts. If the lock passes within the vulva, there is considerable danger—especially when the woman is under the influence of chloroform, and is thus unable to give any evidence of particular suffering—of pinching in some portion of the soft parts, and inflicting serious laceration.

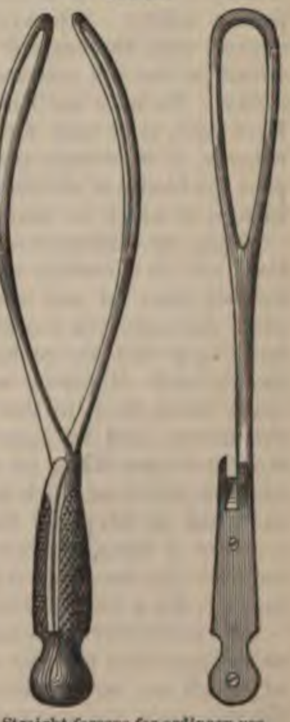
To obviate this risk, and at the same time to render the forceps capable of more extended application, we have always advocated the employment, in ordinary practice, of an instrument which is both longer and stronger than the ordinary short forceps. Such an instrument as this, which fulfils equally well all the purposes of the short forceps, is also applicable to cases in which the head is in the centre of the cavity, or even a little higher. In these latter cases, the lock is still external, and the power of the instrument is considerably increased. The handles are somewhat stronger, and the blades a little thicker, than the ordinary short instrument; for it is a fundamental rule, in the construction of the midwifery forceps, that, for obvious mechanical reasons, we must increase the strength in proportion to the length of the blades. And, in doing so, it is also proper so to construct the handles as to give the operator sufficient power; as no greater error can be committed than to sacrifice power to elegance, or to a dislike to give the instrument a formidable appearance. The following remarks by Dr. Barnes are so apposite to this, that we quote them here. "It has been sought," he says, "to make an instrument safe by making it weak. There can be no greater fallacy. In the first place a weak instrument is, by the mere fact of its weakness, restricted to a very limited class of cases. In the second place, if the instrument is weak it calls for more muscular force on the part of the operator. Now, it is sometimes necessary to keep up a considerable degree of force for some time, and not seldom in a constrained position. Fatigue follows: the operator's muscles become unsteady; the hand loses its delicacy of diagnostic touch; and that exactly balanced control over its movements which it is all-important to preserve. Under these circumstances, he is apt to come to a premature conclusion, that he has used all the force that is justifiable; that the case is not fitted for the forceps, and takes up the horrid perforator; or he runs the risk of doing that mischief to avoid which his forceps was made weak. The faculty of accurate gradation of power depends upon having a reserve of power. Violence is the result of struggling feebleness, not of conscious power. Moderation must emanate from the will of the operator; it must not be looked for in the imperfection of his instruments. The true use of a two-handed forceps is to enable one hand to assist, to relieve, to steady the other. By alternate action the hands get rest, the muscles preserve their tone, and the accurate sense of resistance which tells him the minimum degree of force that is necessary, and warns him when to desist."

It is, perhaps, natural that an operator should prefer that form of forceps to the use of which he has been trained, and upon which he knows, by experience, that he can thoroughly depend in times of danger and difficulty. In confessing, however, a personal predilection for the straight forceps, it is proper to observe that many of the most experienced and distinguished practitioners, both in this country and abroad, express a decided preference for the pelvic curve. No English writer has so emphatically pronounced against the straight variety as Dr. Barnes, in his recent work. Personal experience, which is corroborated by that of many able and experienced accoucheurs, prevents us from perceiving the strength of his arguments, or the justice of his conclusions; and we object more particularly to the assertion that the straight forceps are specially dangerous to the child. It may well be that the pelvic curve in the hands of those skilled in its use is equally efficient. That it is so, cannot, indeed, be doubted, and it is possible that, when once adjusted, the danger of slipping is less when used by the inexperienced, but we conceive that such problematical advantages are more than counterbalanced by the following. First, the blades are more easily introduced with reference to the position of the child's head, if the operator has but one curve to think of; second, the two blades, being the same, no mistake can possibly be made between the upper and lower, or anterior and posterior blade; and third, that if it should be found necessary to alter the position of the head by rotation, this can only be effected by the straight instrument.

The forceps, the use of which we recommend to young practitioners, who generally possess but one, is an instrument of a size intermediate between the ordinary forceps and what will presently be described as the long forceps. It is, as already mentioned, applicable for all the purposes of the short forceps, but by means of it we are able to operate quite as easily when the great diameters of the head are on a level with the middle plane of the pelvis. It is, as represented in the accompanying cut, similar in appearance to the ordinary short forceps, but considerably longer. It is fourteen inches in length, the blades to the lock being nine, and the handles five inches. The fenestræ are four and a half inches in length, and something less than an inch and a quarter in the widest part. The distance between the blades in the widest part of the curve is three inches, and at the tips a little under an inch. The handles are lengthened to secure a better hold,—an advantage which is unimportant, if not questionable.

Cases requiring the use of the forceps are very variable in their general features, but most of them may be referred to one or other of the following groups. We may have, in the first instance, cases in which everything is normal save expulsive power, which may utterly fail as the period of delivery approaches: this failure of the *vis a tergo* is familiarly known as "uterine inertia," and from it arises, more frequently than from any other cause, the necessity for operative assistance. In another group, the operation is rendered necessary by a minor degree of pelvic deformity, at the outlet or in the cavity, of which flattening of the sacrum is an example, probably of more frequent occurrence than is usually supposed. In occipito-posterior positions and in face presentations, the forceps may be found necessary either for rectification or direct extraction; and, in convulsions, or any other condition calling for speedy delivery, it may be necessary to use the forceps if the labor has sufficiently advanced to admit of the safe application of the instrument. Some of the rarer circumstances calling for the forceps have already been mentioned, such as certain cases of rupture of the uterus, placenta

FIG. 147.



Straight forceps for ordinary use.

prævia, funis presentation, or rigidity of the soft parts. In cases of breech presentation, or after turning, it is frequently necessary to apply the forceps when the trunk has been born, in order to extract the head from the soft parts and protect the child from suffocation. The instrument being specially constructed for application over the cranial bones is only applicable, as is evident, to a limited class of cases. For other presentations, which may require operative assistance, other mechanical aids must be sought. The necessity for operation arises more frequently in primiparæ than in women who have already borne children.

Application of the Forceps.—Before, in any case, making the slightest attempt in this direction, we must be sure that neither the bladder nor rectum are distended, and this caution is specially required as regards the bladder, from which the contents must, if necessary, be withdrawn by the catheter. An essential condition is, according to all authorities, complete dilatation of the os, but some difficulty unfortunately seems to exist in determining what we are to understand by "complete dilatation." The cases which are undoubtedly most favorable for operation are those in which the os is absolutely obliterated or drawn up beyond the reach of the operator over the advancing head. But if we limit the employment of the instrument to these cases alone, we shall certainly withhold assistance in many in which we might deliver the woman with perfect safety. Obliteration of the os or actual continuity of the uterine with the vaginal canal is no doubt desirable, but we must not admit as true the statements of those who tell us that it is essential to safety. To wait until the lip of the os can no longer be felt, as some have said, is to wait for what may possibly never occur; and, in like manner, if we accept the rule as perfectly correct that we are never to pass the blades of the forceps within the uterus, we may allow the period to pass at which we may, by prompt action, save the life of the child.

Complete dilatation of the os is, indeed, in a sense, absolutely essential; and it is certain that a greater degree of dilatation is necessary for this than for any other of the operations for delivery. But complete dilatation, in the sense which we would attach to the term, does not imply that the os has passed out of reach beyond the head, but merely such dilatation as will admit of the passage of the head. In many cases, then, we are justified in passing the blades partly within the uterus, and we apprehend that Dr. Ramsbotham's assertion is strictly correct when he affirms that the forceps may be used in some cases in which as much as a third part of the circular margin of the os uteri can be felt; and there can be no doubt that, in a considerable number of cases, recession or retraction of the os, and especially of its anterior lip, does not occur immediately upon full dilatation, nor, it may be, for a considerable period thereafter.

The possibility of feeling an ear has been very generally looked upon as an important and, by some, as an essential condition, in the absence of which we would never be justified in operating. That, in short forceps cases, the ear may often be reached with ease, when the other operative conditions are fulfilled, is undoubted; and, in cases in which we are only called in when a large caput succedaneum has in some measure obliterated the landmarks on the surface of the cranium, it is really important that we should seek for and observe the ear, with the view of determining the exact position of the head. But to accept this as a rule for our guidance in every case, is both unnecessary and improper, as the ear, in some cases in which we may hold the operation to be perfectly justifiable, can only be reached with difficulty or with an amount of violence which may greatly aggravate the sufferings of the patient. To these we might add other conditions, which have been prescribed as essential to the safe performance of the operation, but which have deservedly fallen into neglect.

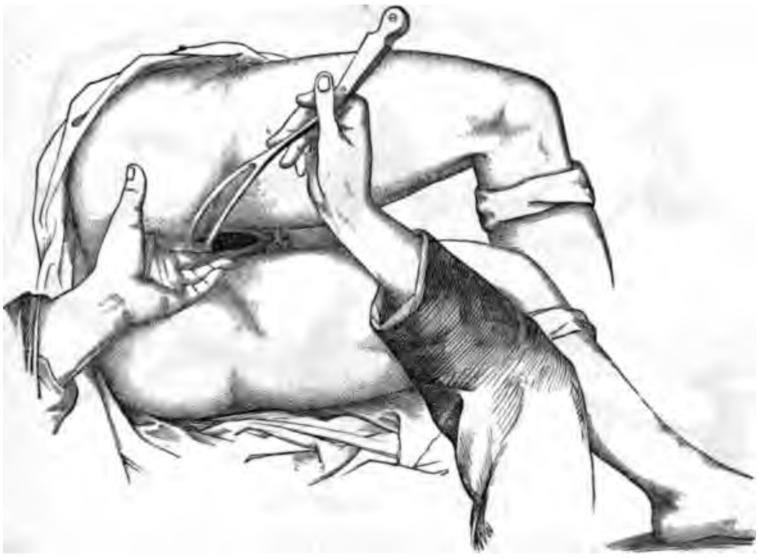
The forceps must be applied directly to the surface of the child's head, and it is therefore absolutely necessary that the membranes be ruptured, should this not already have spontaneously occurred. We have been summoned with a view to delivery by the forceps in a case in which it was stated that the os was fully dilated, although it turned out that the os was very slightly dilated and only reached with difficulty in the posterior part of the pelvis, the thin uterine wall being still extended over the surface of the scalp. Such a condition could, with ordinary care, scarcely lead to an error in practice, but the possibility of a mistake should nevertheless be borne in mind by the inexperienced.

If possible, but with exceptions to be afterwards noticed, the blade should be applied to the sides of the child's head. To do this with accuracy, it is necessary that the actual position of the head be made out with perfect certainty. This may be ascertained, as has been explained in a former chapter, by a careful examination of the sutures and fontanelles, and of the relation which these parts bear to the pelvic canal; and, as there are four possible cranial positions, we must first be sure with which of them we have to deal, before we ever take the instrument into our hands. It is only, as we have said, when exceptional difficulties exist that we require to examine the ear. No one, therefore, is qualified to attempt delivery by the forceps unless he is familiar with the laws which regulate normal parturition; and there is, in fact, no operation or contingency in midwifery practice, in which a thorough knowledge of the mechanism of labor, in all its details, is so essential as this. It is unnecessary to inform any one familiar with the details of normal parturition, that the method of application will depend upon the situation of the head. In proportion to the proximity of the head to the external parts will the movement of rotation be found, in the ordinary position, to have occurred; and, therefore, the nearer it is to the outlet, the more will we require to apply the blades in the transverse diameter of the pelvis, in our endeavor to adjust them to the sides of the head. When, however, the head is higher, its position is more decidedly oblique, and, even at the outlet, a little of this obliquity still obtains; so that, to insure their application to the sides of the head, we must apply them *in the opposite oblique diameter to that in which the child's head lies.*

Having satisfied ourselves as to the position of the head, and that the conditions exist which warrant the performance of the operation, we prepare the forceps by warming and greasing the blades. The patient, who lies in the ordinary midwifery position, is to be brought quite to the edge of the bed, so that her hips may even project a little over it, and she is then to be brought, with due caution, under the influence of chloroform. We should be perfectly satisfied with her position before commencing the operation, as to change her position after one blade has been introduced is not free from risk. If the head is at the outlet and resting on the perineum, the blades are to be introduced so that the handles shall look *forwards* under the arch of the pubis; if rotation has not yet occurred, and the head is consequently in the lower part of the cavity, they will look *downwards;* and if the head is higher in the pelvis, they will look more or less *backwards* in the direction of the perineum. If, however, it is still high in the pelvis, or at the brim, we should use the double-curved long forceps; for, our object being to apply extracting force in the axis of that part of the pelvis which the head occupies, we must discard the straight forceps so soon as the shanks of the blades come to press upon the fourchette. This we do for various reasons, to be afterwards more particularly explained in connection with the subject of the long forceps, not the least of which is the danger to the integrity of the perineal tissues which would accrue in an attempt to pull the head backwards in a direction even approaching to the axis of the brim.

Let us suppose the head to be in the position which in seventy per cent. of cranial presentations it occupies,—in the right oblique diameter, with the forehead towards the right sacro-iliac synchondrosis, and the occiput to the left foramen ovale. The blades, in this case, are to be passed in the direction of the left sacro-iliac synchondrosis and the right foramen ovale, or, in other words, to the poles of the left oblique diameter of the pelvis. With reference to the position of the woman, we shall speak throughout of the "upper" and "lower" blades. It is of no great importance which of these blades is first introduced, but it is proper that every operator should have a definite plan of procedure, which he may adopt in every case. If he introduce, as we are in the habit of doing, the lower blade first, he grasps one of the blades with the fingers of his right hand as he would a catheter, and holds it for a moment diagonally across the breech of the woman, with the concavity of the blade turned towards her, the point downwards and to the left, the handle upwards and to the right. In this position it will correspond to the left oblique diameter, and from this it should not deviate or twist in any way during its introduction. Two or three fingers of the left hand, which have been duly anointed, are then to be passed into the vagina, over the left ischial tuberosity, in the direction of the corresponding sacro-sciatic ligaments, with the palmar surface upwards, until the head is reached. The blade is then passed along the fingers, and, if the os is still distinguishable, it is to be carefully guided within it. If the handle is now gradually depressed, and at the same time gently pushed onwards, it will generally glide over the convex surface of the cranium without the slightest difficulty or danger. Should the blade turn or twist in the direction either of the hollow of the sacrum or of the foramen ovale, it is on no account to be replaced forcibly, but it is to be partially withdrawn by raising the handle, and reintroduced with greater care. The handle is then carried towards the perineum, and intrusted to an assistant while the introduction of the upper blade is being effected.

FIG. 148.



Introduction of the lower blade.

The operator should take the second blade with his left hand, so that it diagonally crosses the breech as before, but with the point above and to the right, and the handle downwards and to the left. The fingers of the right hand are then passed in the direction of the right foramen ovale until the head is reached and along their palmar surface, which is turned downwards, the blade is then to be introduced. The reason for bringing the woman quite to the edge of the bed now becomes obvious, as it is only in this way that the handle of the upper blade can be sufficiently depressed to admit of its easy introduction. This blade is introduced, as will be observed, *in front* of the lower blade, as it is only in this way that the two parts of the forceps will lock.[1] The hand is now to be steadily raised, when, under the direction of the fingers, the blade will glide over the right side of the child's head. An excellent guide during this part of the operation is derived from an observation of the inner or metallic surface of the handle, which should remain parallel with the corresponding surface of the lower blade, and the earliest deviation of the blade from its proper course will be found in an inclination of this surface to one side or another. Should this occur repeatedly, after partial removal and introduction of the blade, it may be advisable to withdraw the lower blade, and introduce it with reference to the other, as there is the possibility of a mistake having been committed as to the position of the head, and it is besides a matter of far greater importance to have the blades exactly opposite to each other, than to have them accurately adapted to the transverse diameter of the head. The best test of a proper application of the forceps is the perfect locking of the blades after their introduction. Fig. 150 shows the blades as adjusted for the first position, the head being in the pelvic cavity, as is indicated by the direction of the handles. The blades being separated by the transverse diameter of the head, the handles are generally about an inch apart.

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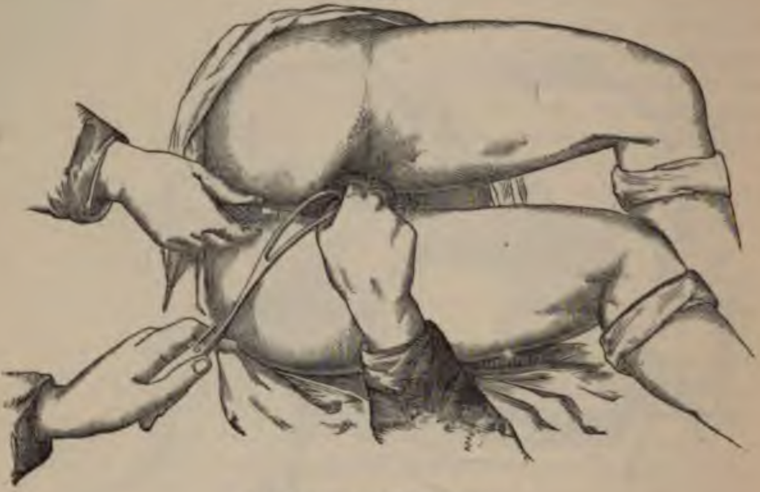
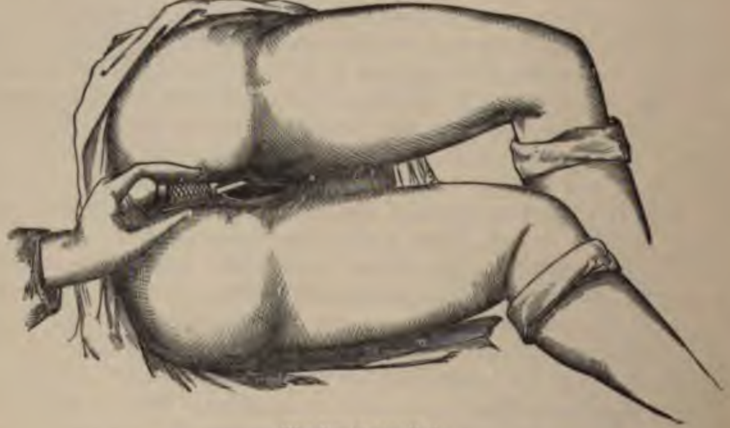
[1] We have frequently observed that students who may be practicing these details with the machine and phantom commit the error of passing the second blade without any reference to the direction of the lock in the first. This error cannot possibly be committed in practice if the directions here laid down are observed.

FIG. 149.



Introduction of the upper blade.

FIG. 150.



The forceps applied.

When the head occupies the second cranial position, the forceps must be applied in the right oblique diameter. The lower blade is therefore introduced in the direction of the left foramen ovale, from which point the handle is first directed upwards and to the left, and then depressed downwards and to the right. The upper blade is then introduced in the direction of the right sacro-iliac synchondrosis, taking care that it is passed in front of the lower blade, and that the metallic surfaces of the handles retain their parallelism as before. In third positions, the forceps must be applied in exactly the same way as when the head is in the first; and in fourth presentations as for the second.

CHAPTER XXIX.

THE FORCEPS (CONTINUED).

ACTION OF THE FORCEPS: 1, BY COMPRESSION; 2, BY TRACTION; 3, BY DOUBLE-LEVER ACTION—MODE OF EXTRACTION: MANAGEMENT AND DIRECTION OF THE HANDLES AT VARIOUS STAGES OF DELIVERY—DELIVERY BY THE FORCEPS IN OCCIPITO-POSTERIOR POSITIONS: ROTATION BY THE FORCEPS: EXTRACTION WITH THE FOREHEAD FORWARDS—THE LONG FORCEPS—REASONS FOR PREFERRING THE PELVIC CURVE IN THIS OPERATION—DESCRIPTION OF THE INSTRUMENT—CASES IN WHICH THE LONG FORCEPS IS APPLICABLE—DIRECTIONS FOR THE OPERATION: BLADES TO BE APPLIED TO THE SIDES OF THE PELVIS: MODE OF INTRODUCTION OF THE LOWER AND UPPER BLADES: RELATION OF THE BLADES TO THE SURFACE OF THE CRANIUM—USE OF THE FORCEPS IN PRESENTATION OF THE FACE—PROCEDURE WHEN THE HEAD IS RETAINED AFTER EXPULSION OF THE TRUNK—MODIFICATIONS OF THE INSTRUMENT: ZIEGLER'S FORCEPS: RADFORD'S FORCEPS.

THE forceps acts mechanically in three different ways in effecting the object which we have in view: by compression, by traction, and by a double-lever action. In so far as Compression is concerned, a certain degree of this is essential, in order to grasp the head with the blades, which otherwise would slip off, or would only be precariously maintained in their position, under certain circumstances, by the pressure of the walls of the parturient canal. But, by compression, something more is implied than mere grasping; for by it, as is obvious from the yielding nature of the sutures and fontanelles, the actual diameters of the cranium may be materially diminished. It is to be remembered, however, that the forceps is usually applied to that portion of the cranium which is least subjected to pressure, and that, therefore, as a rule, little is to be gained by diminishing these diameters. We may, in fact, assume that the pressure which is necessary to insure such a grasp of the head as may render it impossible for the blades to slip under moderate efforts, will effect all the compression which is desirable. Many recommend that a piece of cord or tape should be firmly tied round the handles in order to keep up sustained pressure on the cranium, and it is for this that the depression near the extremities of the handles, which is characteristic of all English forceps, is intended.

This mode of procedure is not to be commended, as such serious and sustained pressure cannot but endanger the life of the child. The power exercised by the hands of the operator, if only the handles are of proper size, is quite sufficient for our purpose, and being necessarily intermittent, is free from the danger which attaches to continuous pressure upon structures so delicate and important as are contained within the cranium. Sometimes, when it is necessary to use very considerable force, the full extent of possible compression must be resorted to, but this more with the view of maintaining a secure hold than of gaining much by mere compression. In such a case, the corner of a towel which has been dipped in water may be tightly bound round the handles at the depression alluded to, when the remainder of the towel being wrapped round the handles will give a better hold and more power; but, when this is done, the pressure should always be relieved during the intervals between the pains, or when at any other time we make a periodical pause in our extractive efforts. The amount of compression which is safe will depend in no small measure on the construction of the forceps; and, in an instrument such as are many of those of French manufacture, with an interval of half an inch only between the tips, the pressure will certainly be attended with more risk than when these are, as they should be, an inch or nearly so apart.

The forceps acts also by Traction; but this force is not applied alone, as in drawing a cork from a bottle, but in combination with the third mode of action of the instrument,—viz., that of a Double Lever. The forceps, as almost invariably constructed with the English or other similar lock, is composed of two levers—the fulcrum of each being the lock. This enables us, by a swaying movement of the hands, to apply extracting force, partly by leverage and partly by traction, to each side of the head successively, without the danger which attaches to the single lever or vectis, where it is necessary to find a fulcrum in some part of the pelvic wall.

When the blades have been adjusted to the satisfaction of the operator, he now proceeds to the actual operation of extraction. As his object should, in most cases, be rather to aid than to supersede the natural efforts, he must merely assist the pains should they be present, and pause when his assistant informs him that the uterine action has ceased. This leads us to observe, that, if it be practicable, the assistance of another practitioner should always be obtained; for not only is there thus a division of responsibility, but the operator has the great advantage of efficient and intelligent aid, to which he can trust for the management of chloroform, the steadying of the uterus, and many other points of detail, which it is impossible to obtain at the hands of those who are ignorant or inexperienced.

When the action of the uterine fibres has ceased—as in cases of complete inertia—he should imitate nature by applying extracting force at intervals corresponding to the ordinary duration of natural pains. The handles should be grasped by both hands, two of the fingers of one hand being passed up so as to impinge upon the head. The object of this is to ascertain the earliest indication of slipping of the blades, which is always more apt to occur when the distance between their extremities is more than an inch. So soon as he feels that his fingers are leaving the surface of the scalp under the influence of his efforts, he knows that the instrument is losing its hold. The blades should then be disarticulated and pushed back to their original position; and, upon renewed efforts, he makes use of a little more compression, thus striving always to effect the dislodgment of the head with as little of actual force as may be necessary. The force should be applied as nearly as possible in the direction of the axis of that part of the pelvic canal within which the head lies; and the operator should act by combining steady traction with a swaying motion of the handles from side to side.

If the head is by these efforts dislodged from the situation in which it has been arrested, and moves downwards into a lower plane of the pelvis, this may, in the presence of efficient pains, be all that is required, as nature will often in such cases complete the delivery. It is better, however, at this stage, not to withdraw the blades, but merely to disarticulate them, and, leaving them in contact with the head, watch the result. If the head now moves satisfactorily with every pain, they may be entirely withdrawn; but, so long as there seems a probability of further assistance being required, it is better to leave them than to run the risk of having again to apply them at a more advanced stage of the labor. If it is a case of inertia, or when there is obvious obstruction at the outlet, our efforts must be continued at intervals as before; resting satisfied with a very gradual advance, and never (unless under exceptional circumstances, when rapid extraction is imperatively demanded) striving for a speedy termination of the case, which might endanger the perineum and the other soft structures which nature in normal cases very gradually distends.

The direction which, in labor, the head naturally takes is always to be kept in mind. As it descends, therefore, if it has originally been in the cavity when the blades were introduced, the handles are to be carried forwards under the arch of the pubis, and, at the moment of birth, are to be raised in front of the symphysis. It is at this moment that precipitation or violence of any kind is so apt to lacerate the perineum, so that we should, by every means in our power, closely imitate the process by which nature so admirably effects the dilatation of this structure. It is usual to practice what is called support of the perineum, in forceps as in ordinary cases; but in such means, as a preventive of laceration, we have, for reasons already stated, no confidence whatever. As the head passes from the cavity to the outlet, the natural movement of rotation is not to be forgotten. It is not, indeed, necessary that we should attempt artificially to produce this rotation. Under the influence of the ordinary causes, nature will effect it at the proper time, whereas we might only do harm by misplaced efforts before that time has arrived. Still, it is proper that we should watch the first indications of rotation, and, in our subsequent endeavors, "humor" the blades so as in every way to encourage it.

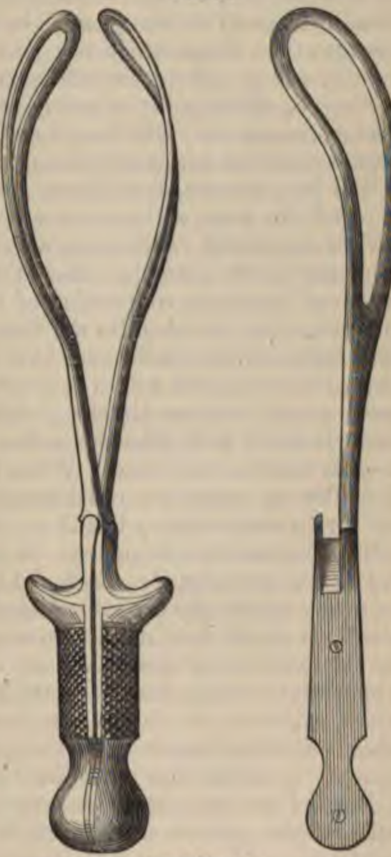
The situation on the sides of the child's head which corresponds to the blades, varies considerably, and will depend, in some measure, on the degree of moulding, or elongation, which may have occurred. When successfully applied, so as to obtain the best possible hold, the tips of the blades will be found to have passed over the ears, and to have grasped the soft parts of the cheek beyond the zygomatic arch. In not a few cases, however, and especially in those in which the short forceps has been used before the head has attained the perineum, they do not reach so far, and in these the point attained will be marked by a depression in the temporal region above the zygoma. Beyond the depression just mentioned, the injury inflicted upon the soft parts of the child should be very trifling, even in severe cases. A certain amount of discoloration, from bruising, is sometimes noticed, but this disappears in the course of a few days.

In the third and fourth, or occipito-posterior positions, the difficulties which we encounter are often much more formidable. These difficulties, it is to be remembered, probably depend entirely on the faulty nature of the position. Our first attempts, therefore, should be to remedy these positions, by promoting the rotation which would bring the occiput forwards. Having failed in our attempts to induce this rotation by the fingers, with or without the vectis, in the manner formerly described (see chap. xviii), we should always try to effect rotation by the forceps, previous to attempting direct extraction. Very special care is here necessary, as a moment's consideration will show, to distinguish between the two occipito-posterior positions. If, for example, we should mistake the third position for the fourth, we would apply our rotating force so as to move the occiput from right to left in an attempt to reduce it to a first position, with the result, if we moved the head at all, of forcing it in the direction of the conjugate diameter, and thus making matters worse, instead of better. If, however, we are confident in our diagnosis, we have only to remember that third positions rotate naturally into the second, and fourth into the first, which at once points to the direction in which alone rotatory force can safely be expended. Dr. Tyler Smith says that we should rotate during the process of extraction; but it is better that we should, in the first place attempt simple rotation, and then, if that fail, combine rotation with extraction. If we succeed, the case, left to nature, will generally terminate in the usual way. But, should we fail, it will be necessary to extract directly, without rotation,—a matter of difficulty always, and sometimes of impossibility.

In delivering by the forceps, while the head remains in the occipito-posterior position, care must be taken to conduct the operation with a due regard to the manner in which nature effects delivery in such cases. If we attempt to drag the head forwards under the pubic arch, we will probably fail; so that we should direct our efforts so as to get the occiput over the perineum,—as it is only in this way that the occipito-mental diameter can be released,—and the forehead is then suffered to sweep backwards from behind the symphysis. The great danger is rupture of the perineum, which, in some instances, it will be almost impossible to avoid; but, when the pelvis is of good size, the difficulties attending such a position are by no means so great as might be supposed. In a case of this kind, seen with Dr. Dunlop, we succeeded in extracting the head, with much more than an ordinary amount of effort, but its birth was attended with a laceration of the perineum, which, at the time, looked formidable enough, but which, as is usual in similar cases, had so much contracted in the course of a few days, as to render any operation unnecessary. Both mother and child did well.

The Long Forceps.—Whatever opinion may be entertained as to the propriety of employing the forceps with a double curve in all cases, without exception, we have no doubt that the long forceps can only be used with safety when constructed on this principle. The objection to the long straight forceps is pretty obvious, if we reflect that any attempt at extraction, exactly in the axis of the brim, is impossible, as the line representing that axis passes through the coccyx, or even the lower part of the sacrum. It is not, indeed, until the head has fallen well into the cavity, that it may be supposed to occupy a plane the axis of which passes in front of the perineum. Not even with the pelvic curve can we pull directly in the axis of the brim, but we are able more nearly to approach to what is desiderated, and, what is much more important, to do so with comparative safety. If the straight forceps is used at the brim, not only do we pull the head too much forwards, but we do so to the imminent danger of the perineum, against which the shank of the blades is pressed. And, if we overcome the first resistance, the widening of the blades exposes this structure to ever-increasing danger as the child descends, for it is not till the head reaches the lower third of the cavity that we can bring the handles forwards. This risk to the perineum is, no doubt, much lessened, if we use an instrument in which the shanks are approximated for some distance, so that the curve of the blades springs from a point several inches from the lock, as in a modification of Beatty's forceps, which has been very commonly used.

FIG. 151.



Long forceps.

In the construction of the long forceps, bearing in mind the rule already laid down, our first point is to insure strength without clumsiness. There is good reason to believe that the neglect of this precaution has been the cause, in many instances, of the instrument slipping again and again. There is no necessity for the blades, if of proper material, to be of great thickness, but the handles should always be large, of sufficient size, indeed, to be firmly grasped by both hands. Endless varieties and modifications of the long curved forceps have been devised, and it is but natural that every operator should prefer his own. The instrument here shown is somewhat similar to what is known in this country as Simpson's forceps, which was adopted by him from the pattern of those used by Naegele and other German accoucheurs. The joints are made so loose as to admit of a certain degree of lateral motion or overlapping, and below the lock there are transverse rests for one or two fingers of the right hand to drag by; "the long forceps," as Simpson observes, "being only properly used as an instrument of traction, not of compression." The length of the instrument which we have represented here is sixteen and a half inches, being ten and a half inches from the lock to the tip of the blades, and six inches for the handles. The measurements between the blades should be the same as those of the medium-sized instrument above described, and the fenestræ about five and a half inches in length. The instrument is thus, as is believed, both longer and of greater strength than those which are generally employed by English practitioners. It is inferior in efficiency to none, and is, if used with due caution, equal in point of safety to any. No one should, under any circumstances, take the long forceps into his hands without a sense of responsibility much greater than attaches to the ordinary operation.

The long forceps, as will now be understood, is applicable to cases in which the head will not enter the brim or descend beyond the upper part of the cavity. The cases which are held to warrant its employment are chiefly those in which the head is arrested at the brim by reason of moderate contraction of the conjugate diameter. Great care must therefore be taken, in the first instance, to ascertain the degree of deformity, and to make sure that the case is really one in which the forceps may be used with a reasonable prospect of success; for, if not, nothing can be more irrational than to subject the woman to the not inconsiderable risk which attaches to this operation, even under the most favorable conditions. When the child is dead, and the estimated difficulty in extraction considerable, most accoucheurs will prefer to deliver by craniotomy; but if, on the contrary, there is evidence of the child being alive, nothing can be more repugnant to the feelings than the idea of an operation which deliberately destroys a life, and we will naturally prefer any procedure which may give the child a chance. To yield too far to this inclination would, however, be manifestly wrong, for the mere fact of the child's life need not enter into the calculation when it is obvious that it must, sooner or later, be sacrificed. Our whole attention, in such a case, should be centred in the mother, in whose interests, therefore, we should decide upon that operation which is likely to subject her to the least possible risk.

But it is not against craniotomy alone that the long forceps may be balanced, for there are cases in which the question for decision is between the forceps and turning, as will be better understood when we come to consider the conditions under which we have recourse to the latter operation. It has been said that the forceps is a "child's operation," but we would take a very narrow and improper view of the scope of the instrument did we conclude that it was always so, and that it was inapplicable in the interests of the mother. The results of craniotomy are, according to Churchill, about one maternal death in five, and we may be sure that when the head is high in the pelvis the figures will be more unfavorable still. Nothing can be more absurd, therefore, than to assume that, in so far as the mother is concerned, craniotomy and the long forceps stand to each other in the relation of safety and danger; and yet it would almost seem that this was the idea which prompted many, even in modern times, to declare in favor of the former.

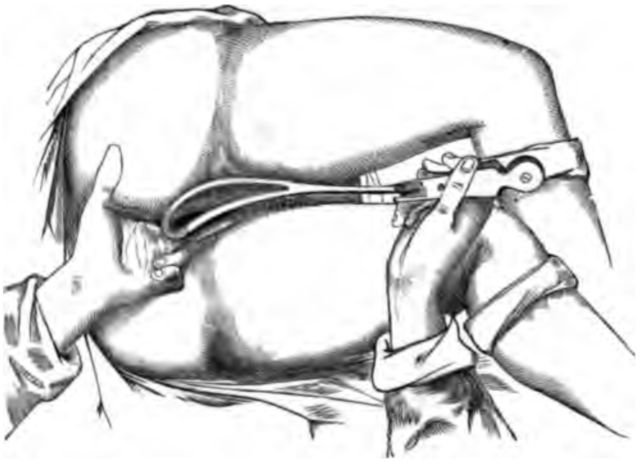
The operation by the long forceps is one to which, as a rule, a considerable amount both of difficulty and danger is attached. This arises from the peculiar circumstances of the case, as compared with the ordinary forceps operation. There can scarcely be a stronger contrast than between a case requiring the application of the short forceps, when the head lies upon the perineum, and is arrested by simple inertia, and one in which a contracted brim prevents the head from entering the pelvic canal. In the one case we have the operation in all its details so thoroughly within our control, that we almost cease to look upon it with the slightest apprehension. In the other, we are operating comparatively in the dark, and at great mechanical disadvantage; we have to subject, to an extent which we cannot fully be aware of, delicate textures to violent compression; we have to drag the head through the whole length of the pelvic canal instead of merely disengaging it from its proximal extremity; and, finally, we have to determine between the amount of actual obstruction and the degree of justifiable force, with a nicety upon which success or failure will depend. Is it, then, to be wondered at that the operation is looked upon with apprehension as one beset with difficulties and dangers?

While we freely admit that the objections with which delivery by the long forceps is beset are in themselves sound, we must, at the same time, express our conviction that they have been in some degree exaggerated; and that, when skilfully and warily employed, the best results will, in some instances, follow from its use,—the one essential element which, above all others, will contribute to success, being a careful selection of proper cases. It is now very generally believed, by those who have had the greatest experience, that a large proportion of the unfortunate results depend upon improper instruments, and especially upon the use of such as are deficient in power. The observations which, on this point, we have already quoted from Dr. Barnes apply here with peculiar force. Power and control are correlative factors towards the attainment of the result which we desire, and if there is a deficiency in the former we can have but little confidence in the issue of the case.

As regards the mode of application, the long forceps differs in many essential particulars from the short. Exceptional cases may no doubt occur, in which the forceps is applied at the brim to effect delivery, which is called for in consequence of inertia, hemorrhage, and the like; but in such cases (in which we may assume the pelvis to be of normal dimensions) the operation of turning will generally be preferred. Delivery by the long forceps may practically be considered as an operation in which the head is arrested by reason of contraction of the pelvic brim. Our object, then, is, not to apply the blades in the opposite oblique diameter of the pelvis to that occupied by the child's head, so as to secure their adaptation to the sides of the cranium, but rather to introduce them with special reference to the pelvic walls, so as to be sure that each passes along the side of the pelvis, and is thus opposite to the other in or near the transverse diameter of the brim. When the head is still above the brim, it usually occupies, as we have seen, a position which is more transverse than usual, and the effect of conjugate contraction at this part is to maintain that position even after the head has actually engaged in the brim. Were we here to follow the usual rule, and did we succeed in applying the blades in that way, their grasp would be in the conjugate diameter, and in every effort we would run the risk of subjecting the soft parts of the mother to injurious pressure between the blades and the poles of the conjugate measurement, the chief danger being posteriorly against the projecting sacral promontory. Consequently, we must discard all preconceived ideas and rules, and pass the blades in the direction in which there is most room.

The patient may here also lie on her left side; and there is this advantage in the double-curved forceps, that there is not the same necessity for bringing the hips over the edge of the bed, as from the nature of the pelvic curve the handle of the upper blade does not require to be nearly so much depressed. The rules given for the introduction of the blades in these cases vary considerably. We prefer, as in the case of the short forceps, to pass the lower blade first. Some operators, following the advice of Madame Lachapelle, will pass this blade along the sacro-sciatic ligament; but the most experienced of modern operators prefer to pass it over the perineum into the hollow of the sacrum, a little to the left of the middle line. If the former method be practiced,

FIG. 152.



Introduction of the long forceps.

the handle must be directed somewhat to the right, although much less so than in the case of the straight forceps. If, on the contrary, the operator should select, as we would recommend, the second process, the blade may be directed, as is here shown, pretty nearly in a horizontal position, into the hollow of the sacrum. That the introduction of the double-curved forceps is a more complicated proceeding than the operation previously described, no one will dispute; and this indeed will appear from the description of this stage of the process given by Dr. Barnes: "As the point of the blade," he says, "must describe a double or compound curve—a segment of a helix—in order to travel round the head-globe, and at the same time to ascend forwards in the direction of Carus's curve so as to reach the brim of the pelvis, the handle rises, goes backwards, and partly rotates on its axis. The handle is now carried backwards and downwards to complete the curve of the point around the head-globe, and into the left ilium. Slight pressure upon the handle ought to suffice. This will impart *movement* to the blade; the right direction will be given by the relation of the sacrum and head." Dr. Barnes further illustrates this by the above diagram (Fig. 153), which we have slightly modified.

FIG. 153.

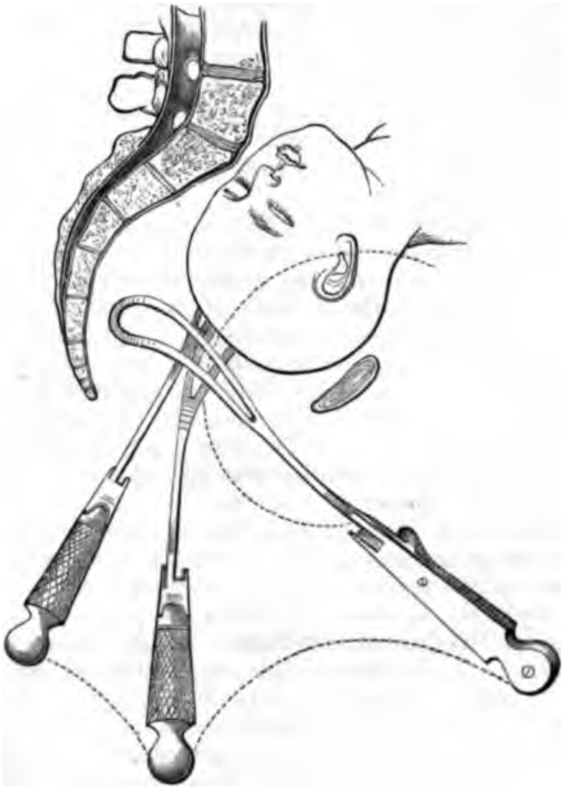


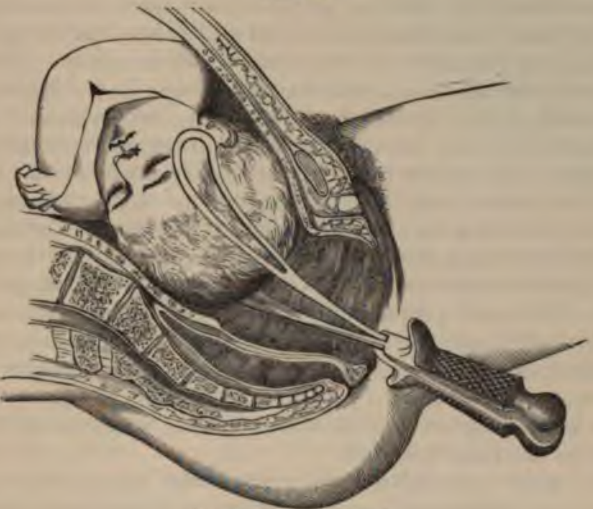
Diagram showing various stages in the introduction of the long forceps (lower blade).

The actual introduction of the blade is by no means so difficult, nor is it a matter of such nicety as the above description would seem to imply. The mere raising of the handle, after the blade has been so far introduced, causes it to glide upwards, unless some obstacle should exist to impede its progress. When thus adjusted to the side of the head, the weight of the handle will tend to keep it in position, but this will be more certainly effected by intrusting it to an assistant, who should hold it back towards the perineum to facilitate the introduction of the upper blade. As in the case of the other, this blade may also be passed in the direction of the hollow of the sacrum, and is carried in front of the lower blade, but somewhat to the right of the middle line. The handle being now depressed and carried backwards, its movement directs the blade along the convexity of the child's head towards the right ilium; and, when the movement is complete, the handles should be in apposition and lock easily. Success in this will, however, depend upon the extent and nature of the distortion, but if the lateral walls of the pelvis are normal as regards their various planes, no great difficulty, after a little practice, will be experienced in the introduction and adjustment of the long forceps. The locking of the blades may be looked upon, not only as evidence that the blades are in contact with opposed surfaces of the head, but also that the case is one in which we may hope for a favorable result. But if, on the contrary, we do not succeed in introducing and locking the blades after one or two attempts carefully conducted, we must abandon the case as one unsuitable for the operation.

It is assumed by many writers that the blades, when introduced, correspond to the antero-posterior diameter of the head. It is not so, however. The head, indeed, very generally occupies the transverse diameter of the pelvis, but the tendency of the blades is to adapt themselves to one or other oblique diameter, as has been shown by Simpson. This has been conclusively established by examination of the head, after delivery by this process, when it is found that one blade has passed behind the ear, and the other has reached over the frontal bone on the opposite side, and has been applied over or in the immediate neighborhood of the orbit, as in the position here indicated.

The forceps being thus applied, the next step in the process is an attempt at extraction. Remembering the power which we possess in so formidable an instrument as this, we must, in the first place, exercise great caution in the matter of compression; and this point is all the more necessary as the handles will be found to gape more than is usual, owing to the length of the cranial diameter which is between the blades. Moderate compression is all that is necessary to maintain the position of the forceps when well applied, for we know that it is not by manual compression only, but also by compression of the blades by the walls of the natural passage, that their grasp is sustained. The handles are to be seized by both hands and steady traction practiced, the direction at first being somewhat backwards. As in case of the ordinary forceps, the traction must not be continuous, but in aid of present, or in imitation of absent pains; and at the same time we combine with mere pulling effort a moderate degree of the swaying or double-lever action, taking great care not to injure the perineum.

FIG. 154.



The long forceps applied.

The thorough control which the size of the handles gives us over the instrument enables us to perceive with greater accuracy whether or not the head can be dislodged by such efforts as we are justified in making. This may be more exactly ascertained by passing the finger from time to time in the direction of the head, when the descent of the occiput or the rotation of the sagittal suture towards the conjugate diameter may afford clear evidence that the head is making progress. As it descends, the handles of the forceps will be observed to rotate, and in some cases it may be possible to assist the rotation. When this stage has been reached, it will be proper to carry the handles more forwards, and to pull rather downwards than backwards, following the curved axis of the pelvic cavity. Finally, the operator must carry the handles forwards and upwards in front of the symphysis; and, in order that this may be effected with ease, the right thigh should be raised by the nurse, or the patient may be laid on her back, so as to permit the handles to move upwards in the direction of the umbilicus. The operator must, however, beware of moving the handles prematurely in this direction, as he may thereby do mischief. And there is another danger which he must specially avoid, viz.: the ploughing up of the perineum by the blade, which, in consequence of the rotation, is now turned against it. This may, no doubt, be avoided by disarticulation of the blades as the head approaches the outlet; but, as it is often necessary to continue the traction to the last, extreme caution must at this stage be observed. In nothing should we be more particular than in the slowness and deliberation with which we conduct the various stages of this operation; for in all the details the more closely we are enabled to imitate nature, the more likely is the operation to have a successful result.

It may be necessary to apply the forceps in the treatment of presentation of the face. So long as the chin is turned forwards, as it is in what we have described as the third and fourth varieties, the case is in all respects a normal one, and should be left to nature. But inertia, and the other causes which call for the forceps in a cranial position, may, in such a case, exist also, demanding instrumental assistance. The application of the forceps is here in no respect more difficult, nor more serious, than when the vault of the cranium is the presenting part, the chin being regarded throughout as strictly analogous to the occiput in the mechanism and direction of its birth. The rules, therefore, which have been laid down for the application of the forceps in occipito-anterior positions of the vertex, may here be adopted, *mutatis mutandis*, with equal propriety. It is very different when we have to deal with a mento-posterior position of the face, which is by far the most unfavorable of all possible presentations of the cephalic extremity. Such is, as we have seen, the probable position of the great majority of face cases at the beginning of labor—rotation, with the chin forwards, occurring as the head descends.

But the cases to which we refer are when this rotation fails, and when the head descends into the cavity in its original position with reference to the pelvis. Two methods of treatment have here been suggested, and have apparently been practiced with success; these being application of extracting force over the forehead in the direction of the occiput, so as to convert it into an ordinary cranial position again, and rotation by twisting the blades. Smellie, Cazeaux, and others, have succeeded by the first method; but that which seems most practicable, at least from a theoretical point of view, is rotation, a manœuvre which, for obvious reasons, can only be practiced with the straight forceps. By the latter means, rectification has in many instances been effected, so as to insure a favorable termination of the labor; and it would be proper in every such case to make the attempt; but, if we fail, and the symptoms indicate approaching exhaustion, or are otherwise such as are held to imply a necessity for speedy delivery, we may have no resource remaining but craniotomy. If, in a deformed pelvis, the face presents at the brim, turning is probably better than the long forceps in every case; and if the chin is backwards, there can be no doubt about it.

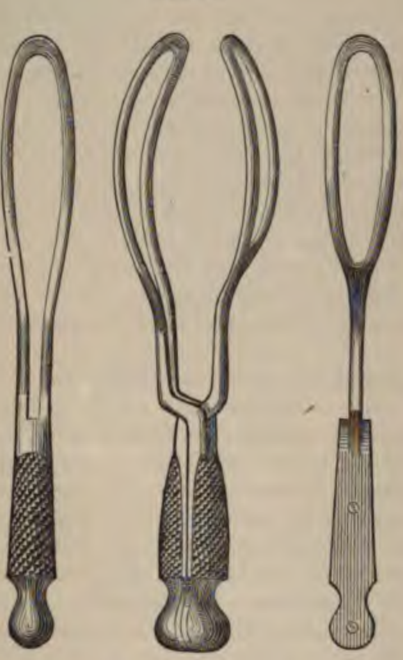
In all cases of breech presentation, and in the last stage of delivery by podalic version, we have the forceps ready, lest any difficulty should arise in regard to the extraction of the head by the ordinary process. The chin, in such cases, being almost always turned backwards towards the perineum, the blades are passed in front of the sternum of the child, over the chin and sides of the head. The body of the child is then to be carried upwards, towards the abdomen of the mother, by an assistant, when, if the handles of the forceps are made to follow it in the same direction, combining the movement with a moderate amount of traction, the head will usually be extracted without difficulty. This is an operation in which delivery must often be effected with greater precipitancy than usual,—as, for example, when twitching of the limbs shows that asphyxia is impending. There are other comparatively rare instances, in which the operation is not effected with such ease. We may encounter cases, for example, in which, the trunk being born, the face has not rotated backwards. These are the instances in which Madame Lachapelle advises us to rotate the face by the finger before extracting it; but, if this cannot easily be done, it will be better to adopt the plan suggested by Velpeau, and endeavor to drag down the occiput beyond the edge of the perineum, and deliver the head by a movement of extension, instead of, as is usual, by the ordinary one of flexion. There are cases, also, in which the head, after turning or in breech presentation, is arrested at the brim in consequence of deformity, when it might be possible to deliver by applying the forceps along the sides of the pelvis; and there are instances, rarer still, in which the head is separated, and left behind in the cavity of the uterus, where we might attempt extraction by the forceps, so adjusting the blades as to prevent the possibility of the occipito-mental diameter being thrown across the pelvis.

The difficulties which, under special circumstances, attend the introduction of the forceps have given rise to innumerable modifications of the instrument, none of them (with a few exceptions, such as the forceps of Mondotte, in which the blades do not cross) affecting the general principles upon which the instrument is constructed. To one or two only of the more important of these we may call attention. Dr. Ziegler of Edinburgh has recommended a forceps of which the blades are straight, but dissimilar. The fenestra of one blade is carried down to the handle, and in introducing the instrument, the elongated fenestra is slipped over the handle of the other blade, which has been previously passed, and which serves, therefore, as a guide for the adjustment of the other. What is described in the *Obstetrical Society's Catalogue* as Mr. Philip Harper's forceps seems, both in principle and in construction, to be identical with Dr. Ziegler's.

Dr. Radford, again, has invented an instrument, of which the blades are of unequal length, and in which there is a reversed position of the lock. This ranks as a long straight forceps, and is designed by the inventor for application to the head when it is arrested at the brim, the long blade being passed over the face, and the short one over the occiput. The opening formed by the curve in the shank of each blade is for the purpose of passing a handkerchief through, and will enable the practitioner, in addition to his hold of the handles, to use very powerful and effective extracting force. To these we might add numerous varieties, which exhibit infinite peculiarities, and which differ from the familiar standards in the nature of the curves, pelvic or cranial, the length of the fenestræ, the width of the blades, and the arrangement of the shanks, handles, and locks. To describe even a tithe of these would carry us beyond our prescribed limits, and would serve no useful purpose.

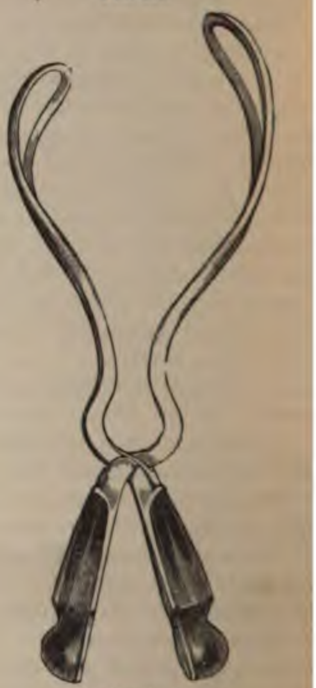
In expressing a preference for the straight over the double-curved forceps, in all ordinary cases, we must not be supposed dogmatically to condemn the latter instrument in what are generally called short forceps operations, or, indeed, in any other, save those in which we use the forceps for the purpose of effecting rotation. The authority of those who have pronounced more or less emphatically in its favor is

FIG. 155.



Ziegler's forceps.

FIG. 156.



Radford's forceps.

of too great weight to be overlooked. We are inclined, more particularly, to admit the force of Simpson's observation, that it is well for the operator to accustom himself to the use of one kind of instrument only, as a strong argument in favor of the pelvic curve; but, on the other hand, we entertain personally a strong conviction that the straight forceps, while it can effect, below the upper third of the pelvic cavity, everything which the other can achieve, is essentially easier of application by beginners, as it is, undoubtedly, simpler in construction than its rival. When once its special difficulties are overcome, we cannot doubt, however, that in hands familiar to its use, the double-curved forceps fulfils all the indications of a safe and efficient extractor.

We would conclude this chapter with a single word of caution to the young practitioner who has overcome the preliminary difficulties, and who has attained a certain amount of confidence and skill in the use of the instrument. It is to beware lest this should lead him to a too frequent and unnecessary application of it. Above all, let him remember, that no mere question of time, or of his own convenience, can ever be a sufficient warrant for operative interference. No operation is without risk, and nothing, therefore, short of a conscientious conviction that he is about to act in the interests of the mother or the child, can ever absolve him from the responsibility which attaches to him in virtue of the position which he occupies.

CHAPTER XXX.

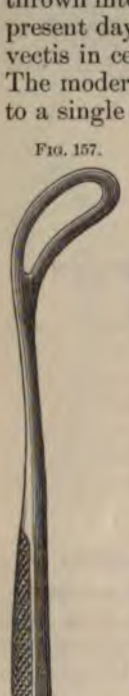
THE VECTIS; FILLET; BLUNT HOOK; &c.: DECAPITATION.

DISCOVERY OF THE VECTIS BY ROONHUYSEN—MODE OF USING THE VECTIS—CASES TO WHICH IT MAY BE APPLIED—THE FILLET; A CONTRIVANCE OF ANCIENT ORIGIN; APPLICABLE CHIEFLY TO BREECH CASES—THE BLUNT HOOK—THE CROTCHET: PRECAUTIONS NECESSARY IN THE USE OF THE CROTCHET: THE GUARDED CROTCHET—USE OF TWO CROTCHETS—DECAPITATION; VARIOUS INSTRUMENTS FOR; DESCRIPTION OF THE OPERATION: EXTRACTION OF THE TRUNK: SUBSEQUENT EXTRACTION OF THE HEAD BY THE VARIOUS METHODS OF THE FORCEPS, CROTCHET, OR CEPHALOTRIBE.

ABOUT the same time that the discovery of the Chamberlens was gradually brought to light and introduced into practice in this country, the Vectis or Lever was being used for the delivery of women in Holland by Roonhuysen. The frequent sacrifice of infant life—which was rendered necessary in cases of difficult or obstructed labor—was no doubt the cause which, in both cases, turned the attention of the inventors to the subject, with the earnest desire to devise any means whereby the crotchet and perforator might be superseded by some contrivance which would deliver the woman without destroying her child. The discovery of Roonhuysen, although of much less importance than that of Chamberlen, was an unspeakable advantage in practice; and by the rude instrument contrived by the Dutch accoucheur, many successful operations were performed by himself, his sons, Ruysch, and some others to whom the secret had been communicated. This original lever was of the simplest possible construction, and consisted of a flat piece of iron, bent at each end into a slight curve, and covered with soft leather to protect the external parts. The secret of the lever was eventually purchased from those to whom it had been handed down after Roonhuysen's death, by two Dutch physicians, Visscher and Van den Poll, whose names are more worthy of being recorded than those of the inventors, as they jointly paid the sum of 5000 livres in order that they might impart to the world a secret which should never have been withheld. As the knowledge spread, the simple contrivance of the originators became altered and modified, until it resulted in the vectis of the present day.

One is apt to suppose, that as the Vectis is now seldom used, it has been discarded as a worthless instrument. So far, however, from this being the case, the vectis must always be looked upon as an extractor of considerable power and efficiency, and the sole reason for the neglect into which it has now fallen, is simply because it has been *utterly* thrown into the shade by the forceps. There are, moreover, even in the present day, practitioners of great experience who occasionally use the vectis in certain cases in preference to the more familiar instrument. The modern vectis has, in its general appearance, a certain resemblance to a single blade of the short forceps, and, like the latter, varies greatly in its shape, handle, and fenestra; but more particularly in the curve which is given to it with a view to efficient adaptation to the head of the child. The variety which is here represented is one of the best known of the numerous modifications of Roonhuysen's lever. It is sometimes furnished with a hinge between the handle and the blade,—a principle which has also been applied by some to the forceps, with the view of facilitating the introduction of the upper blade. Such an arrangement is, however, quite unnecessary, if the woman is placed in the proper position on her left side, and her hips are brought quite over the edge of the bed, when it may be introduced without difficulty with reference to any position of the head, or any part of the circumference of the pelvic wall.

FIG. 157.



The vectis.

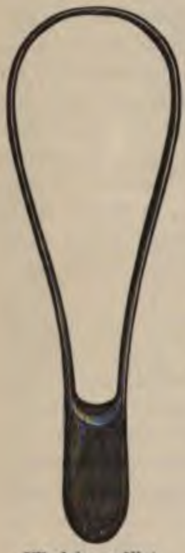
If we had not at our command a safer and more perfect agent in the forceps, there can be no doubt that the vectis would be an instrument of every-day use for the extraction of the child, whether employed as a lever or a tractor. These two ideas have, manifestly, been the guiding principles upon which suggestions as to the modification of the instrument have been based: when the idea of leverage has predominated, the curve has been slight; whereas, when traction has been the object, the curve has been greater, so as to secure, for this purpose, a firmer hold of the head. No efficient action of the vectis can, however, be produced, unless the principle of a simple lever is more or less brought into play; for, even if we admit it as possible that it may act as a tractor, it can obviously act only upon the end of a cranial diameter, which latter thus becomes a lever, the fulcrum of which is at the other pole of the diameter thus acted upon. But its efficient action is scarcely compatible with this idea, as it will generally be found necessary so to use it as to make the blade itself a lever, the fulcrum of which must be found in some part of the pelvic wall. This, in fact, is the great objection to the vectis, when we compare it with the forceps, where the fulcrum of each blade is the lock. It may no doubt be possible, in the case of the single lever, to protect the soft parts by interposing a finger where the force is brought to bear upon the fulcrum, and we may be sure that this is the manner in which Roonhuysen and his followers operated; but still, even under the most favorable circumstances, the danger which arises from such a plan of action must be viewed as considerable, and in direct proportion to the mechanical force employed.

When the vectis is used with the view of facilitating delivery in the ordinary cranial positions, it is essential, in the first place, that the sition of the head be accurately ascertained; and further, that the peration should be conducted with a perfect knowledge and appreciation of the laws upon which the natural phenomena of parturition epend: the object being chiefly, therefore, to bring the occiput forards under the arch of the pubis. If we should thus succeed, by ulling down the occiput, in increasing the occipito-frontal obliquity of he head, it is clear that we are, at the same time, closely imitating the process by which nature manages the descent of the head. This may, f the uterus is acting efficiently, be all that is required; and, in any ase, it advances matters a stage. But in cases of unusual difficulty or bsolute inertia, little ultimate good will result if we stop short at this tage of the operation, so that we can only act effectively by bringing ur force to bear against the two ends alternately of the occipito-frontal iameter. So soon, therefore, as we have succeeded in causing the cciput to advance, the vectis is to be withdrawn and adjusted to the rontal pole; and by thus acting, now on the occiput and again on the forehead, we may certainly and steadily cause the head to advance in the direction of the outlet. A blade which is sharply curved will, no doubt, take a firmer hold of the part to which it is applied; but this advantage is probably more than counterbalanced by an increased difficulty in its introduction. It is for this reason that a more gentle or wider curve has been generally preferred, which, while permitting of easier introduction, makes it more necessary that the blade itself should be used as a lever; and, indeed, some have gone so far as to say that no vectis can possibly be better than a single blade of the straight forceps.

It would appear that the cases in which the modern accoucheur may, with advantage, have recourse to the vectis are those in which his primary object is to act upon the occipito-frontal diameter of the head. Should it seem, therefore, that all that is necessary is to insure the descent of the occiput, it is possible that delivery may thus be effected with even more safety than by the forceps, where the action bears upon the poles of the transverse diameter. Contingencies may also arise, in the course of many operations in midwifery, in which the operator might avail himself of the vectis if it were at hand; but it is probable that in no instance is the vectis more applicable than when we wish to correct malposition of the vertex. The natural process, by which occipito-posterior positions of the vertex terminate by rotation, has already been fully described; and it has also been observed that an essential condition to such rotation is the descent of the occiput, along the posterior pelvic wall, while the forehead remains high in the direction of that cotyloid cavity to which it is turned. In proportion, therefore, as the forehead descends (*fronto-cotyloid* position of West) along the anterior wall, the more do we despair of natural rotation, and look with apprehension to the probability of a tedious labor, or a birth with the forehead to the pubis. Much may, as we have shown, be done by the fingers of the operator directed against the frontal end of the occipito-frontal diameter; and, indeed, while propulsive effort exists, nothing is so likely as this to encourage descent of the occiput. But when this procedure fails, we have in the vectis a powerful auxiliary, which we may pass over the occiput; and thus, by pulling the occiput down and pressing the forehead up, we act simultaneously upon the two poles of the long diameter, in restoring or maintaining that position of the head in which alone nature effects rotation. We may even conceive it possible that, by a similar mode of procedure, we might convert by this instrument a face presentation into one of the vertex, by producing a rotation of the head on its transverse axis. We assume, then, that, with rare exceptions, the vectis, although a powerful instrument, is completely superseded by the forceps—by which can be effected, more speedily and more safely, almost all that the vectis can accomplish.

The Fillet (*laqueus*) is probably the most ancient of all the instruments used in obstetrics with the view of extracting a living child. In its simplest form it is nothing more than a loop or noose, which may be variously adjusted so as to facilitate the delivery of the child. It has been constructed, according to Ramsbotham, "of a strip of strong cloth, silk, or leather, formed into a running noose, and was sometimes sown up like an eel-skin, open at both ends, to admit the introduction of a piece of whalebone, cane, or wire, throughout its entire length, by which its application might be facilitated. It was intended to be introduced over the head in whatever way was most easily accomplished; and this done, the cane was to be withdrawn, the loop tightened, and extraction was to be effected by main force." Such an instrument is, in as far as cranial positions are concerned, so manifestly inferior to the forceps, that we can scarcely wonder that it has so completely fallen into disuse as not even to be mentioned in many of the best works on obstetrics. Some modern authorities have, however, so far approved of the principle upon which it is constructed as to direct their ingenuity to the manufacture of a more perfect instrument, of which the "whalebone fillet," here shown, is the most familiar illustration. Its length is about ten inches, the loop being seven inches and a half, and its extreme width three inches and a half. In its application the loop is to be passed over the occiput, and steady traction exercised, when, if this is not sufficient, it may be adjusted over the forehead or chin, thus alternating the extracting force between the frontal and occipital poles of the long diameter of the head in a manner somewhat similar to what is practiced in the case of the vectis.

FIG. 158.

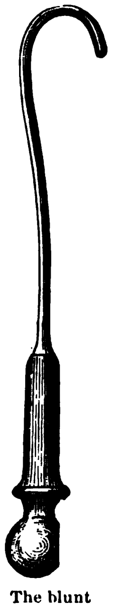


Whalebone fillet.

The fillet may still be usefully employed in the management of breech presentations, when delivery is arrested either by inertia or disproportion of the parts. Some have, under such circumstances, insisted that the forceps may be used, but the experience of the great majority of practitioners has shown that we cannot depend upon that instrument, which is essentially constructed for application to the cranium. A most efficient means of extraction is, no doubt, afforded here by the blunt hook, but the objection to that instrument, as has already been stated, is the injury which may, by its use, be inflicted upon the groin and genital organs of the child. The fillet may, however, be substituted, and employed both with safety and efficiency. A simple loop or noose, as was the nature of the original fillet, is, in such instances, to be passed over the flexure of the thighs, by means of the fingers, an elastic catheter, or (as has been suggested) the instrument which was designed by Belocq for plugging the posterior nares. Nothing serves the purpose better than a simple skein of worsted, one end of which is introduced in this way, and the other extremity then passed through it so as to form a running noose. This noose may, again, be adjusted so as to direct the extracting force in the proper manner; and, as our object generally will be to pull down that hip which is turned forwards in the pelvis, in advance of the other, the noose should therefore be placed nearly over the anterior ischial tuberosity.

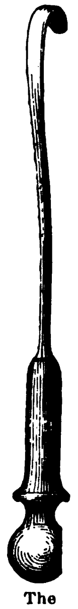
The Blunt Hook, which is here shown, is also an instrument of ancient date. It has been recommended in cases of obstructed breech delivery; but the danger of wounding the soft parts of the child which it entails, is now very properly held to be such a serious objection to its use, that it has been entirely discarded in cases where there remains a possibility of the child being alive. In all cases in which the child is ascertained to be dead, the blunt hook may be used without hesitation; and, in these cases, it is a powerful auxiliary to many of the more important operations of midwifery. It is, however, less an instrument adapted to any special operation, or operations, than one which may be useful in a hundred different ways, while we are attempting to extract the child in cases of unusual difficulty. It acts most powerfully when hooked into the flexure of a joint. In this way, as we have seen, powerful extracting force may be brought to bear, when the breech presents, by passing it over the groin; and, in like manner, in cephalic presentations, the shoulder may be made to advance by tractile effort of a similar kind brought to bear upon the axilla. But while these are, perhaps, the circumstances under which the blunt hook is most frequently and usefully employed, it gives no idea of the real scope of the instrument. This, indeed, embraces points in the detail of many of the chief operations of midwifery; and, in the forcible extraction of the child, after the performance of craniotomy or embryulcia, the hook is almost indispensable. Its advantage, as compared with the crotchet, is that, as there is no necessary laceration attendant upon its employment, it is not absolutely unsuitable for the delivery of a living

FIG. 159.



The blunt hook.

FIG. 160.



The crotchet.

child; and, besides, that being blunt, there is not, should it chance to slip, the same risk to the maternal parts.

The Crotchet was described by Hippocrates, more fully by Ætius, and is alluded to more or less distinctly by all the ancient writers on midwifery. It is, like the instrument just described, a hook; but it differs essentially in this, that it is always sharpened, so as to pierce the tissues, and thus secure a better hold. In its nature, then, the crotchet is an appliance which can never be used when we have any hope, however remote, of saving the life of the child. The introduction and fixing of the instrument is a matter of little or no difficulty, nor is it attended with any danger to speak of, as the sharpened portion, being the point of the hook, is turned downwards. But, so soon as the direction is reversed, and we attempt extraction, the crotchet becomes, in careless and inexperienced hands, a highly dangerous implement. In all cases, therefore, in which a sufficient hold can be had, we will, as a matter of course, prefer the blunt hook; but, when it is necessary to act upon flat surfaces, the blunt hook is worthless, and we are obliged to have recourse to an instrument which may penetrate, and thus be fixed upon any surface to which it is applied. The nature of the crotchet renders, however, the maintenance of its grip upon soft tissues extremely precarious, and any violent effort at extraction can scarcely fail to cause extensive laceration, which, in its turn, permits of the sudden detachment of the instrument from the point at which it has been fixed. Every practical accoucheur knows that no confidence whatever can be placed in the instrument as a tractor, unless we can fix it in some unyielding part of the bony structures, upon which alone we can safely bring anything like efficient effort to bear.

But even this is far from safe; for, under the influence of powerful effort, the crotchet may at any moment, even when it is apparently well fixed, break suddenly from its attachment. This is, in fact, the special danger of the crotchet, and the great objection to its use, as by such an accident the maternal structures may, in a moment, be seriously, or even fatally injured. It is on this account that no sound practitioner will ever use the crotchet, without taking great pains against the possible effect which may ensue; and he therefore invariably uses the finger of one hand as a guard to the crotchet, so that if it should slip, the maternal parts are efficiently protected. An instrument called the "guarded" crotchet, in which a spoon-shaped blade is substituted for the fingers, as a guard, is, as we shall find (see. Fig. 168), occasionally used at a certain stage of the operation of craniotomy.

While we thus admit the full force of the objections which exist to the use of the crotchet, it must be confessed that, in cases of great difficulty, it is a valuable, and almost indispensable aid. The point of greatest importance is to secure for it a firm and unyielding attachment, so that it is usual to try to fix it in the orbit or mouth, or elsewhere in the same region, so as to secure an efficient hold upon the irregular bones of the face; ar [illegible] se instances in which it is passed within the cranium, or any [illegible] r [illegible] avities of the body, the same principle guides o [illegible] find ourselves at one time fixing it in the foramen magnum, and at another attaching it to the spinal column, or the pelvic brim.

The nature of the crotchet is such that it can operate upon one point only of the circumference of the head, or other presenting part. If we act, therefore, in an ordinary cranial position, in this manner upon the orbit, we run the risk of dragging down the forehead by a movement of the head on its transverse axis, without securing any actual advantage, and with the possibility, if the chin be backwards, of making matters worse. Ætius, in one of the most interesting passages of his obstetric works, recommends that we should operate by two crotchets, applied at the side of the pelvis, to opposite surfaces of the child's head, and then pull downwards, in order that the traction may be equal, and in the direction of the resultant of the two forces (*ad neutram partem declinans*). Had he but thought of the possibility of applying the same principle to the delivery of the living child, he would almost inevitably have discovered the forceps. But, as in the case of Hippocrates and the olive, such speculations are perhaps more interesting than instructive. The hint here given, as to the combined action of two crotchets, is not to be despised, as there are certainly cases in practice in which the principle indicated might usefully be adopted; and this, in fact, was recommended and practiced by Dr. Davis. In so far as cranial positions are concerned, in which the forceps fails, or in which the use of that instrument is contraindicated, no good can possibly result, except under peculiar or exceptional circumstances, from the use of the crotchet, until we have already diminished the head by perforation of the cranium, and extraction of its contents.

Decapitation.—An instrument closely resembling, in shape and general appearance, the blunt hook, but which is generally sharp within the curve, has been used with success in the treatment of those difficult cases of transverse presentation in which the ordinary methods of treatment have failed. This operation simply consists in abridging the long diameter of the child by a section made at the neck. It is described by Celsus, and by many writers subsequently, but, with the exception of Davis, Ramsbotham, and, more recently, Barnes, the subject has not received that attention in this country which it seems obviously to merit. It seems to us advisable, therefore, that we should in this place describe the operation somewhat in detail. This mode of procedure is chiefly applicable to those instances in which we have to deal, either with a neglected case of shoulder presentation, where the body of the child is partly impacted, or is so tightly embraced by the uterus as to render turning impracticable; or with a case in which the difficulty arises mainly from pelvic distortion, complicated with a transverse position of the child.

The form of hook already described is that which is best known in this country, and is commonly called Ramsbotham's hook; but a number of other instruments, more or less resembling this, as well as some of a different construction, have been recommended. Among the latter may be mentioned a contrivance which consists of a strong cord, which is to be passed round the neck, and then, by a saw motion, is carried to and fro by means of cross handles at its extremities, until the head is severed. It is probable that a modification of the wire-rope écraseur might be advantageously used for the same purpose, but the difficulty in such cases would probably be the passing of the rope around the neck. It would appear that, with the ordinary instrument, a cutting surface is by no means absolutely essential, as some have succeeded by means of the ordinary blunt hook. The operation of decapitation by Ramsbotham's hook or Braun's "decollator," is well described by Dr. Barnes as consisting of three stages. The first stage is the application of the decapitator and the bisection of the neck; the second is the extraction of the trunk; the third, the extraction of the head.

The first point to be accurately ascertained is the position of the body of the child, whether dorso-anterior or dorso-posterior. This being determined, in the manner already described, by an observation of the prolapsed hand, and the woman being placed in the ordinary obstetric position, or on her back, the arm is to be firmly pulled downwards, so as to bring the neck, as far as is practicable, within the reach of the operator, and is then to be intrusted to an assistant, whose duty it is to maintain the position by steady and moderate traction. The bladder—and, if it be necessary, the rectum—are now to be emptied of their contents, and the hands and hook smeared with lard or oil. The fingers of one hand—right or left, according to the position—are then gradually insinuated in a direction corresponding to the anterior surface of the child, so as to reach the front of the neck. With the other hand the operator then introduces the hook, "laying flat," says Barnes, "between the wall of the vagina and pelvis and the child's back, until the beak has advanced far enough to be turned over the neck. The beak will be received, guided, and adjusted by the fingers of the left (opposite) hand. The instrument being *in situ*, whilst cutting or breaking through the neck, it is still desirable to keep up traction on the prolapsed arm. In using Ramsbotham's hook, a sawing motion must be executed, carefully regulating your action by aid of the fingers applied to the beak. If Braun's decollator be used, the movement employed is rotatory, from right to left, and at the same time, of course, tractile. The instrument crushes or breaks through the vertebræ. When the vertebræ are cut through, some shreds of soft parts may remain. These may be divided by scissors, or be left to be torn in the second stage of the operation—the extraction of the trunk."

The delivery of the trunk and limbs of the child is now to be effected mainly by pulling upon the arm; but should the force requisite be considerable, it will be proper to pass the blunt hook into the axilla of the opposite side, in order to economize the tractile force on the depending arm. Care must, however, be taken not to use the hook with too great force, as by thus causing the premature descent of the upper shoulder we would throw the great diameter of the shoulders across the pelvis, and thus, it may be, render the extraction of the trunk a matter of increased difficulty. Generally speaking, no great difficulty, in the absence of pelvic deformity, will be encountered in this stage of the operation; and steady traction will cause the shoulders, trunk, and breech, successively to pass along the pelvic canal. The head, if completely separated, will move to the side, and will be no obstacle to the passage of the body.

The extraction of the head of the child, which constitutes the third stage of the procedure, is by no means an easy operation, and is sometimes, in fact, the most difficult point of all. A good deal will depend upon the condition of the uterus as regards contraction. During the second stage it will be the duty of an assistant to keep up steady pressure upon the fundus of the uterus, and to follow it downwards as the trunk is being gradually expelled, so as to encourage, as far as may be possible, efficient and symmetrical uterine contraction, under the influence of which the head will be grasped, forced down in the direction of the cavity, and maintained in a comparatively fixed position. Another condition likely to exercise an important influence is the state of the head itself, which, if decomposition has advanced, will be easily compressible, the flat bones being so loosely connected with each other as to admit of overlapping to a very unusual extent. Various methods have been suggested and practiced for the extraction of the head from the uterus. The instances in which it is expelled by the natural efforts are few, and no confidence can, for obvious reasons, be placed in the occurrence of such a result. In some cases it has been successfully removed, when compressible from putrefaction, by the fingers of the operator; but in almost all ordinary cases instrumental aid is required, when we have the forceps, the blunt hook, the crotchet, and the cephalotribe to select from.

The great obstacle, in such cases, arises from the mobility of the head, which rolls about within the cavity, and can sometimes only be seized with difficulty. If, however, the head can be steadied and pressed downwards by the assistant, whose hands are employed for this purpose in the hypogastric region, the difficulty in question may be overcome. If it be possible to fix the crotchet, or a small blunt hook, in the foramen magnum or orbit, success may, in this way, with the aid of the fingers, be quite practicable; but the risk of the crotchet slipping is so considerable, that the more experienced modern operators have pretty much discarded that instrument in favor of the others which have been mentioned. The safest and most satisfactory operation, when it is practicable, is that by the ordinary midwifery forceps. The difficulty in this, as in the other operation, is to fix the head; for, as soon as one blade is introduced, the head may escape to the upper part of a relaxed uterus, or to either side, so as completely to elude the grasp of the blades; but if we can succeed in seizing the head, either antero-posteriorly or laterally, delivery will usually be completed without any further obstruction. The only other point to which it is necessary to pay particular attention, is the adjustment of the blades in such a manner as may obviate the possible danger arising from jagged spiculæ, which may project from the severed vertebræ, or from such splintering elsewhere as may possibly have been the result of previous operative efforts.

There are cases, however, in which much more serious difficulties attend the extraction of the retained head. The worst examples of this are instances in which there is pelvic deformity, and in which it may be quite impossible for the ordinary diameters of the head to pass. In these, and in the more difficult of the cases unconnected with pelvic distortion, it has been suggested that the perforator should be used. It is to be feared, however, that, even in the hands of the most skilful, great risk will attend the use of that instrument; and, even if it were not so in their hands, it must be admitted that the operation is one which we would not, without great apprehension, intrust to the inexperienced. Hazardous as the perforator always is, it is in this instance peculiarly so, owing to the mobility of the head, in consequence of which it may rotate suddenly and unexpectedly at the moment of perforation, and thus direct the sharp point of the instrument against the uterine wall with possible results too fearful to contemplate. If we are able, by means of external manipulation, to fix the head against the brim, the perforator may be successfully employed against the occiput; but, as mere pushing force would most likely dislodge the head, it is proper to combine boring with the more violent effort, which will certainly, in economizing the latter, conduce to the safety of the operation generally. After perforation, and evacuation of the contents of the cranium by a process exactly similar to that which will be described under the head of Craniotomy, the extraction of the head by the guided crotchet, or still better, by the craniotomy forceps, will be a matter of no great difficulty; but, in both cases, the greatest possible care should be taken, as the head descends, to preserve the soft parts from laceration by the splintered fragments of the bones. The Cephalotribe is an instrument for which, in the management of such cases, we must express a very decided preference, as being both safer and surer than either the perforator or the crotchet, and almost as simple as the forceps in its application and management, as will be hereafter explained. And, after discharging its special office of crushing the head, which is of such importance in contraction of the brim, the cephalotribe may further be employed as an extractor. The crushing process may be single or double, but in either case the hold obtained by the blades of the instrument gives a grasp of such power that extraction may then be an easy matter. In this case, as in that of the forceps, the difficulty is in steadying the head until the blades are passed and locked.

It is not only as a sequel to the operation of decapitation that extraction of the head has to be effected, but it is also sometimes required under other circumstances, such as its accidental separation after the operation of turning. This is not likely to occur in experienced hands, but the separation of the neck of a putrid child does not require much force, and might happen to any one. Far less excusable are the cases in which, in a breech presentation, or after turning, the head is arrested at the brim, and such violence is used in attempts at extraction as to result in tearing the trunk away from the head. In the absence of evidence of the death of the child, it is scarcely to be conceived that any one would use such violence as would of itself sacrifice the life of the child. But, if the child be dead, the operator might imagine that this is the safest and most natural method of delivery, and act accordingly by employing an amount of force which, in the interests of the mother, is quite unjustifiable, even should he succeed in his endeavor, seeing that he has, in the forceps and the perforator, agents by which maternal risk is materially reduced. As an illustration of what ignorance and inanity may achieve under the seal of the profession, we may here mention the details of a case of this kind, which was brought under our notice many years ago. A young practitioner in a remote country district having performed the operation of turning, experienced such difficulty in getting the head through the brim that he called in the aid of a friend of no greater experience than himself. Under the influence of vigorous efforts thus reinforced, the body of the child was brought into the world minus the head. The removal of the retained head was too much for the combined skill of the two operators, so that, after repeated failure, they held a council; and, after due and solemn consultation, resolved to perform, and actually did perform—what?—the most ingenious and speculative of our readers can scarcely conceive it—the *Cæsarian Section!*

CHAPTER XXXI.

TURNING.

VARIOUS METHODS OF TURNING: TURNING AS PRACTICED BY THE ANCIENTS: PODALIC VERSION—CIRCUMSTANCES WHICH CALL FOR, AND CONDITIONS FAVORABLE TO THE OPERATION: THE OPERATION IN DETAIL: CHOICE OF HANDS: INTRODUCTION OF THE HAND: PASSAGE OF THE OS: SEIZURE OF A FOOT OR KNEE—CIRCUMSTANCES WHICH RENDER TURNING DIFFICULT: DIFFICULTY IN SEIZING THE FOOT—CHILD TO BE TURNED FORWARDS—MANAGEMENT OF THE CASE AFTER VERSION—PELVIC VERSION—CEPHALIC VERSION—TURNING IN CONTRACTED PELVIS: DEGREE OF DISTORTION WHICH MAY ADMIT OF TURNING—TURNING CONTRASTED WITH THE LONG FORCEPS, AND AS A SUBSTITUTE FOR CRANIOTOMY—SPECIAL DIFFICULTIES—BIMANUAL OR BIPOLAR VERSION: PROCESSES OF WIGAND, LEE, AND BRAXTON HICKS.

THE operation of Turning, in its most extended sense, implies a manœuvre by which one of the poles of the long diameter of the child is brought into the brim of the pelvis, the long diameter of the fœtal oval being thus made to correspond to the long diameter of the uterus. Two varieties of turning may therefore be practiced: these are turning by the head, or, as it is generally termed, Cephalic Version; and turning by the feet, or Podalic Version. A special modification of the latter, in which the breech, and not the feet, is brought down, has been occasionally practiced, and separately described.

From the time of Hippocrates down to the middle of the sixteenth century, Cephalic Version was almost exclusively practiced, the head of the child being assumed to be the only natural presentation. This assumption led to the frightful practice of turning by the head in all presentations of the pelvic extremity. It is quite clear that both

Aristotle and Celsus held more correct views; but the practice of Hippocrates, nevertheless, held its ground until the period which we have mentioned; so that, up to that time, the modern operation of turning, as practiced at the present day, was quite unknown. In 1561, Pierre Franco, in a work devoted chiefly to Surgery, suggested the mode of turning by the feet, and this was subsequently adopted by Paré, Guillemeau, Mauriceau, Baudelocque, and La Chapelle, to the complete exclusion of the cephalic operation. The difficulties which, under certain circumstances, surround the modern operation, seem, as late as the end of last century, to have suggested doubts as to its propriety in the minds of Flamand, Osiander, and other distinguished accoucheurs of that time, who therefore suggested that the practice of Hippocrates should be resorted to in all but original presentations of the breech or feet, to the exclusion, absolutely, of the new method. These views found favor chiefly in Germany, but the podalic method made steady progress, and came ultimately to be generally adopted. The contemptuous manner, however, in which cephalic version was passed over or condemned by many of the most eminent writers of this period, led for a time to the complete abandonment of this process; but, in the present day, its value finds general recognition in a certain class of cases,—limited, no doubt, in point of numbers, as will be more particularly shown in the sequel.

What is now, however, universally described as, *par excellence*, the operation of Turning, is Podalic Version, which consists in bringing down the feet when another part presents, and thus converting it into a footling presentation. The circumstances which call for this operation embrace a large proportion of all cases in which a speedy delivery is required, and especially those in which the necessity has arisen early in the course of labor. Among the circumstances thus alluded to, may be mentioned placenta prævia, prolapse of the cord, sudden death of the mother, certain cases of rupture of the uterus, and, in the opinion of many, cases of moderate pelvic distortion, in which it has been proposed as a substitute for the forceps or the more formidable operation of craniotomy. In transverse or shoulder presentations, again, it is the invariable procedure; and, in so far as this particular case is concerned, it has already been described at some length.

It is of the first importance that the conditions favorable to the operation should be correctly appreciated. As it is usually performed, it is essential that the os and cervix should be sufficiently dilated to permit of the passage of the hand; but, as a moderate degree of dilatation only is requisite for this, it follows that turning is available at a stage of labor considerably earlier than we have seen to be necessary for the safe employment of the forceps. Another favorable condition, applicable alike to all cases, is, that the membranes should be intact. The reason of this is obvious; for, so long as the liquor amnii remains, the walls of the uterus are separated, in proportion to its quantity, from the body of the child, the mobility of which is consequently greater. Nothing, indeed, contributes so much to the ease with which turning is effected as this; and, if the waters have escaped, and the womb has thus been permitted to grasp the body of the child, the operation is then found to stand in a very different category. The condition of the os as regards *dilatability* is another most important consideration, for a rigid or unyielding condition of this part of the passage is justly looked upon as an unfavorable circumstance, and it is therefore proper to wait, so long as the membranes remain unruptured, until nature overcomes this resistance.

The Operation.—The condition of the bladder and rectum having been attended to, the woman is, in the first instance, to be placed in a convenient position. Some operators prefer that she should be on her back, and others that she should be on her elbows and knees; but the English operator will generally choose the ordinary midwifery position on the left side, the nates being brought to the edge of the bed, so as to be within convenient reach. She should then be brought under the influence of chloroform. This has the effect of facilitating, both directly and indirectly, the passage of the hand, by overcoming rigidity and spasmodic contraction, and obviating the embarrassment which may arise from movements which are the result of apprehension or pain. The uterus is to be supported by an assistant or by the other hand of the operator. By this means valuable assistance is afforded, by movements which are made in concert so as to bring the lower extremities of the child within reach.

The directions which are often given as to the hand which should be employed are of little practical value. Indeed, it is impossible in some cases, as in placenta prævia, to recognize, before it has been passed into the uterus, the conditions which are held to indicate the right hand or the left. Most people can act much more efficiently with the right than with the left hand, and there is no possible direction within the pelvis in which the right may not be passed. The positions in which there is most difficulty are those in which it may be necessary to direct the hand towards the left sacro-iliac synchondrosis while the woman lies in the ordinary position on her left side. In this case the hand must be pronated to the fullest extent; and, if this movement of pronation is increased, as it may be by the operator turning his back towards the patient, it will pass without difficulty. The left hand would undoubtedly serve the purpose better here, if we could be sure of equally efficient action with it after the introduction. But, if the operator is left-handed, he should use the left hand in preference to the right; and, as our first object is to attain the abdominal surface of the child,—which, in the great majority of all positions, lies towards the back of the mother,—and as it must clearly be easier to pass the left hand along the sacrum than the right, the left-handed operator has a certain advantage. For the same reason, he who is ambidextrous should use that hand which may best suit the position of the child; but, if it should be impossible to ascertain the position, he should select the left, as being more likely to conduct him to the anterior surface of the child's body.

The operator should take off his coat, and bare his arm, so as to obviate, as far as is practicable, any inconvenience which may arise from pressure upon the muscles. The hand and arm are then to be liberally smeared with lard, and the points of the fingers, which are brought together like a cone, are introduced within the vulva, and steadily pushed upwards in the axis of the outlet. In the event of unusual contraction at this stage, the obstacle will, to some extent, be overcome by separating the fingers, so as to stretch the parts. No such difficulty, however, usually exists, but a more important one is encountered as the knuckles approach the orifice of the vagina. This is increased by the action of the constrictor vaginæ muscle, especially in those cases in which chloroform has not been administered; but the resistance, by the stretching action of the fingers, combined with moderate and unremitting pressure, will speedily be overcome, when the rest of the hand will pass into the vagina, the muscles retracting upon it as it advances, and ultimately grasping the wrist. It is at this stage proper to pause, which affords us an opportunity of more carefully examining the presenting part, and, it may be, of ascertaining the direction in which the hand is to be passed, with greater certainty than can be attained by the finger only.

The operator, bearing in mind the curve of the pelvic axis, now alters the direction of his hand, so that its advance may coincide more with the axis of the brim. His subsequent procedure will depend chiefly upon the condition of the os. If it is well dilated, soft, and distensible, the hand may be passed at once, and turning will probably be effected with such ease as may astonish the inexperienced. But, if the os be comparatively undilated, or in any degree rigid, he must proceed more warily, so as to avoid the slightest approach to violence,—introducing first one, then two, and subsequently the remaining fingers, in the most cautious manner possible. It is generally said that, to warrant an attempt at turning, the os must be dilated to the extent of a crown piece. This is, of course, only intended as an approximation; and as much or more will depend on the dilatability, as upon the stage of actual dilatation.

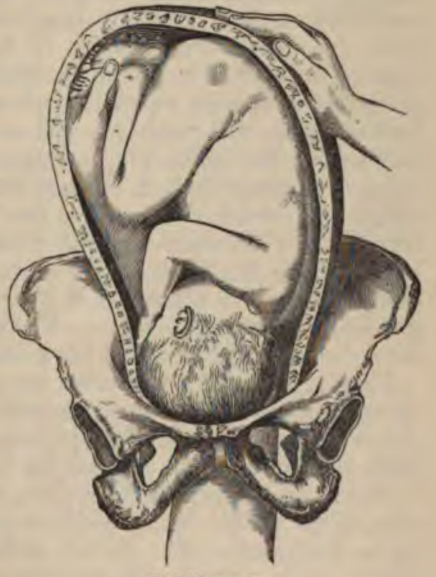
If the membranes are still unruptured, another object in avoiding abruptness in manipulation is to preserve the membranes intact. With this in view, therefore, we direct the fingers, so soon as they have passed within the os, between the uterine wall and the external envelop of the ovum; and, the connection between those parts being lax, no great difficulty is generally encountered in passing the hand upwards, without rupturing the membranes, in the direction of the feet.

No part of this process is, however, to be attempted, without reference to the natural expulsive efforts. If the uterus is acting in the usual manner by rhythmical contraction, we should choose the period of relaxation for the advance of the hand; but, so soon as the advent of a pain is announced by contraction of the uterine walls, the hand should be allowed to lie quite flat and inactive, with the palm towards the child, until the period of relaxation marks the moment when our efforts may be safely resumed. Any attempt at continuous effort is wrong in principle, and is, we may be sure, apt to cause laceration, and even rupture of the uterus. This rule is one which is not observed in practice so strictly as it ought to be, and the wonder is, that accidents are not more frequent than they actually are, in cases where force is employed by the operator with no reference whatever to anything save the resistance which he encounters. It will, however, as must be confessed, often be found that the stereotyped direction to act during an interval, and pause during a pain, cannot well be adopted, for the simple reason that the contact of the hand excites the uterus to continuous, or at best remittent action, so that if we are to wait for absolute inaction on the part of the uterus, we may abandon the effort altogether. Such continuous or spasmodic action as this may be, as we have seen, allayed by the administration of chloroform; and, if it should persist, we may still succeed, although it is necessary, in such instances, to act with redoubled caution and deliberation.

As soon as the hand has reached so high in the uterus that the inferior extremity of the child can either be felt, or may be assumed to be on the same level, the sac of the liquor amnii may be ruptured, and the fingers passed in the direction of the foot or knee. The rupture of the membranes is easily effected, by an effort of the fingers or the action of the nails in the direction of the fœtus; but with this the mechanical advantage of the liquor amnii is not lost, as it is still retained by the efficient plug formed by the arm which occupies the os uteri. This renders the actual version an easy matter. The fingers of the operator lay hold of a foot or a knee, which, in withdrawing his hand, he brings with him, choosing, if he can, a moment of uterine rest for the purpose, and availing himself, if it be necessary, of the assistance of the other hand, which is to be applied externally. As this is being done, the original presentation retreats from the lower segment of the uterus, so that the turning part of the operation is complete.

Much argument has been wasted as to the propriety of bringing down one leg or two. The sound rule in practice is, that when we succeed in securing one foot, we should never pause to search for the other; as one is all that is necessary, unless, perhaps, in cases of pelvic deformity, which we shall afterwards more particularly allude to. Nay, more than this, the descent of one leg has a positive advantage as compared with two, as thus, by increasing the diameter of the pelvis of the child, the parts are more thoroughly dilated, so as to admit of the ultimate passage, rapidly, and with comparative safety, of the head of the child. And, as this is the stage at which the life of the child is most frequently compromised, it is assumed, that by abridging its duration, fœtal life in the aggregate must,

Fig. 161.



Podalic version.

by this process, be saved. Still, when a very rapid delivery is desired, the operator knows that he has a better and more efficient hold upon two limbs than he can have upon one; and he will, therefore, very naturally, bring down both when they are within easy reach; but, when the discovery and seizure of the other limb involve extra effort or delay, not even in such a case as this should he be otherwise than content with what he has already achieved.

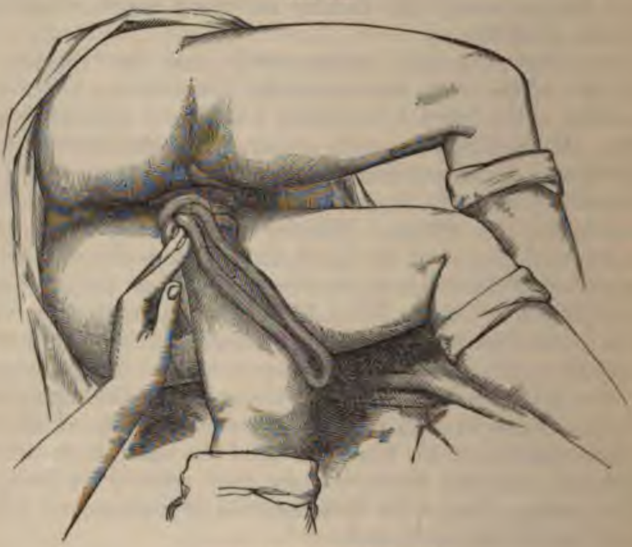
Constriction of the vaginal orifice, and incomplete dilatation of the os, are, as we have seen, difficulties which are often encountered in attempts at turning. Far more serious than those are the obstacles which we meet with, when the conditions which we have indicated as favorable to the operation do not exist. A case, for example, may be brought under our notice for the first time at an advanced period of labor, in which the os has been permitted to dilate, the membranes to rupture, and the presenting part to descend in the pelvis before the nature of the case has attracted particular attention, or the necessity for turning has been recognized. The most familiar illustrations of this are shoulder presentations, already described. In such cases, the liquor amnii has, we shall suppose, long since escaped; the uterine walls have grasped the child in a firm embrace; and the long-continued uterine action has forced the shoulder down into the cavity of the pelvis. If pelvic distortion should exist, impaction may have taken place; but, independent of this, mere tonic uterine contraction may so wedge the head as to render the case practically as bad as one of real impaction. In such cases, the difficulties are often insurmountable, for the operator cannot even pass his hand beyond the presenting part, and is obliged to desist, or have recourse to some of the other operations of midwifery. It is perfectly impossible to describe what experience alone can teach,—the amount of force which, in this, or any other stage of the operation, we are warranted in employing. Anything even approaching to what we would call violence, is not only improper, but ineffectual, so that moderate and sustained effort, combined with an insinuating movement of the fingers, should always be preferred, as being comparatively both efficient and safe. If, for example, we were rudely and recklessly to thrust the hand into the vagina without observing the precautions we have detailed, we should, in all probability, inflict severe laceration on the parts; but if, on the contrary, we act with caution and discretion in a case precisely similar, we effect our purpose with ease and safety. The same principle obtains, and should never be lost sight of, in all the subsequent stages.

Impaction implies resistance from the pelvic walls; but we have obstacles of a not less insurmountable kind in the rigid condition of the os or uterine walls, when, although success by violence may be possible, it is only to be effected by what involves serious risk to the mother. It is such considerations, therefore, based on general principles, which should be our guide in practice, and deter or encourage us in an individual case. It not unfrequently happens, as practice has taught every experienced accoucheur, that these successive stages of difficulty have been, one by one, surmounted, and yet, at the very moment when success seemed just within our grasp, further progress was arrested. The tips of the fingers may even touch the knee or foot, and yet the inch or so of further advance which is required can scarcely, by any moderate effort be achieved. This is a moment at which, in our eagerness, we are very apt to pass the line which separates prudence from safety. By a vigorous thrust of the arm, we may be confident that we shall attain what we so much desire; and it is with difficulty only that we can refrain from what alone seems wanting to complete success. We must, however, with firmness and what we may term self-denial, resist this inclination, and wait a little until, perchance, we may wear out the uterine resistance which constitutes the barrier to our progress.

It is here, however, most unfortunately, that the straining of the fingers is apt, along with violent uterine contractions, to cause cramp of the muscles of the hand, a condition which may absolutely paralyze our efforts. By resting for a time, or stretching the fingers, the power of the hand may return; but it too often occurs that we find ourselves quite powerless just at the moment when we have come to count upon success crowning our efforts. Nothing will remain for us, in such a case, but the withdrawal of the hand, to our great chagrin, and either the introduction of the other, or the reintroduction of the same one after it has had time to recover. What is particularly annoying, when this is found to be necessary, is that the withdrawal of the hand from the uterus permits of the escape of what liquor amnii remains, and, consequently, of a still greater degree of uterine contraction upon the body of the child. Even in such a case, however, we may ultimately succeed by perseverance; and, when the hand has again been successfully introduced, our external manipulations may succeed in bringing the feet within reach. But, with this measure of success, our difficulties may be far from being at an end.

It sometimes happens that the hand is introduced, the foot seized and brought down to the os, and yet complete version cannot be effected. When the presence of the liquor amnii, or a relaxed condition of the uterine walls, permits of a certain degree of freedom of motion, the presenting part will recede as the foot is pulled downwards to the os. But, when the body of the child is firmly grasped by the uterus, this is not the case, and some further manœuvring, external or internal, will be required to complete the operation. The mode of acting externally through the abdominal walls has already been alluded to, and will again be more particularly described. The internal manipulation in these cases consists in pushing up the presenting part while we pull down the foot. In other words, we act upon the two poles of the long diameter of the fœtus instead of one only. The vagina, however, being already fully occupied by the hand of the operator, it will be impossible for him to act upon the presenting part without letting go the hold which he has of the foot; but this is of all things what he least wishes to do, as there is often great difficulty in securing it again. By a very simple expedient he is able to effect all that he desires. A running noose of tape or worsted is to be passed over the forearm, and is then pushed upwards over the hand and beyond the os calcis and instep of the foot. When tightly drawn, this secures an admirable hold, and the hand may be withdrawn, or at once brought to bear upon the head or presenting part, while the other hand pulls steadily upon the noose. The same principle has been adopted, by Braun and other eminent Continental practitioners, when difficulty arises in seizing the foot, and various instruments have been devised by them with this purpose. One of these is described by Hyernaux of Brussels, under the name of *porte-lacs.* When such combined action upon the two extremities of the child fails, it may be impossible to effect delivery in this way; so that we may have to fall back upon the perforator or decollator, as the case may be. Before finally abandoning the attempt to deliver by this method, we must be sure that we have pulled down the foot in the proper direction, so as to turn the child *forwards.* An error here is not likely, as we would naturally pull the foot, when seized, directly towards the os; and if we have passed the hand along the abdominal surface, we can scarcely go wrong; but it is quite possible that, by omitting this precaution, and passing the hand over the dorsal surface, we may not only find it vastly more difficult—if, indeed, it be possible—to reach the foot, but we may discover, in addition, that when it is reached and seized, turning is impracticable after all.

FIG. 162.



Turning by the noose or fillet.

It is generally recommended by systematic writers, that we should so manage the operation as to make sure that the abdomen of the child is turned, after version, towards the spine of the mother, as is indicated by the toes being directed towards the sacrum. This is, however, by no means a matter of such importance as it might appear, for if, as often happens, the toes should be pointed to the symphysis pubis, the trunk of the child will rotate as it descends, so as to bring the face ultimately into the hollow of the sacrum, whatever the original position may have been. But, when the natural rotation has not taken place, it has been found necessary to assist the movement by manual interference. The greatest caution must, in every case, be exercised, to prevent, as far as may be possible, pressure upon the cord; but, in so far as this is concerned, what has already been said in regard to presentations which are originally of the pelvic extremity, will serve for our guidance in those cases in which the pelvic end of the fœtal oval is artificially, and for a particular purpose, brought down. One advantage of effecting version, so as to bring the dorsal surface to the front, will be to bring the cord naturally into the posterior part of the pelvis from the first, by which we are enabled to place it in that situation in which it is least likely to be subjected to severe pressure.

When version is complete, we have converted the case, whatever it may originally have been, into a presentation of the feet. It remains, however, for consideration, whether we are to leave the case to nature, or proceed to immediate delivery. It is almost always proper to pause, at least for a time, until we see what nature is likely to do; but, if the symptoms are such as to call for prompt action, whether in the interests of the mother or the child, we must act boldly, and without hesitation, in effecting immediate delivery. It should be remembered, that so long as the pelvis of the child remains above the brim, the cord cannot be subjected to any dangerous pressure, so that, while nothing is lost by delay at this stage, something may be gained by pausing until uterine energy is awakened. If the cord has prolapsed, or has otherwise come within reach, at this or a subsequent stage, we will be guided by the presence or absence of pulsation, and the other evidences of vitality of the fœtus, in determining whether to precipitate matters or not. During the descent of the trunk, we must observe the usual precautions, but at the last stage there must be no delay, and the forceps and restoratives should be at hand, so that we may at once have recourse to them should occasion arise, and that in the manner described in the chapter on Pelvic Presentations.

The term Pelvic Version, as employed by English writers, implies an operation in which the breech, and not the feet, is brought to the os when another part originally presents. That this may, in rare instances, be effected by dexterous management, does not admit of dispute; but, at the same time, such a course of procedure is so obviously one of greater difficulty, as compared with podalic version, that we need not wonder that the former operation, which, indeed, never attracted much notice, has been all but entirely superseded by the latter. As regards the ancient operation of Cephalic Version, it seems certain that there are cases of transverse presentation in which we would be justified in making an attempt at what is a less severe operation to the mother, by pushing up the shoulder, and so manipulating as to cause it to be replaced at the os by the head. Success could here only be hoped for when the child is still movable within the uterus, and the method most likely to be attended with success is what has been designated, by Braxton Hicks and others, as the "bimanual" or "bipolar" method,—to be afterwards described.

The application of the operation of ordinary or podalic version to cases of pelvic contraction, is a mode of procedure which was practiced long before the forceps was discovered. Nor did the discovery of that important instrument throw the earlier operation entirely into the shade; and, indeed, we find Denman, and other contemporary writers, giving minute directions, a hundred years ago, as to the manner in which the operation is, under such circumstances, to be effected. There can be no doubt, however, that as operators became more skilled in the use of the forceps, and the scope of that instrument became more thoroughly understood, the number of cases of contracted pelvis in which turning was practiced, was more and more diminished in number, until, at last, the operation fell into complete disuse. In the present day, the operation has been revived and strenuously advocated by Simpson; and, although some experienced operators have condemned it, it is the fact that many of the most distinguished living accoucheurs have adopted his views and practice. Simpson maintained his position by arguments and facts,—the former being characterized by the ingenuity and ability which he possessed in such a high degree, and of which his works afford no more striking illustration.

The fact that this operation involves a question of conservative midwifery, is one which may alone suffice to secure for the subject earnest and careful attention; and this, indeed, it has received from almost all recent writers. In cases in which the head is arrested by pelvic contraction at the brim, we have three possible modes of action between which we must decide,—turning, forceps, or craniotomy. The two first are conservative, the last destructive. The dangers and difficulties of the long forceps are well known, and have been fully described; but there are, probably, few operators who would not rather risk them than wantonly destroy a living child, as we have too good reason to believe has often been done. The case is quite different when the child is dead; for here we determine upon a plan of action which we undertake solely in the interests of the mother, when craniotomy stands before us under quite another aspect. The first point of importance, then, is to determine whether or not the child is alive; and if, this being established, we fail to deliver by the long forceps, or that instrument is contraindicated, the question before us simply is: Shall we turn, or perforate—attempt to save the child, or at once destroy it?

The reply to this question, involving as it does such weighty responsibility, will depend upon a variety of circumstances, of which the most important, perhaps, is the degree of pelvic distortion which actually exists. It is impossible to fix the exact measurement of the conjugate diameter which may be held to warrant an attempt at turning; and even were it possible to determine this with fractional accuracy, our modes of practicing pelvimetry are so uncertain that it is a matter of the greatest difficulty, even to the most dexterous, to gauge a pelvis during labor. Dr. Churchill fixes the limit at two inches and six-eighths, and Dr. Barnes, as we believe, with more justice, at from three and a quarter to three and three-quarters inches; so that we may say, in round numbers, that when the conjugate diameter is less than *three inches*, to attempt to turn would be to subject the woman to needless risk, while we may be confident that nothing but failure could attend our efforts.

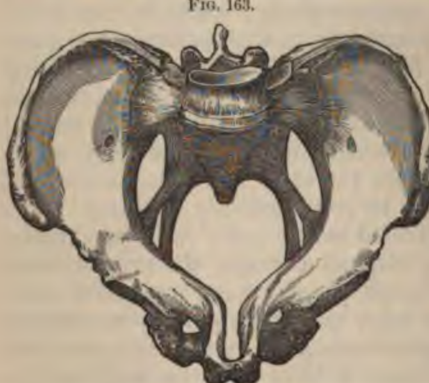
But seeing that this is a question where an eighth of an inch may make all the difference between success and failure, and it is impossible to ascertain the exact space with anything more than what is at best an approach to accuracy, it follows, as a possible contingency, that we may actually turn, and subsequently find that we have miscalculated either the conjugate diameter or the size of the head, and that the latter will not pass. Such a failure as this is not so serious a matter as might at first sight appear; for if we have thus to resort ultimately to craniotomy, that operation will be attended with very little more difficulty and no greater risk than if we had begun by perforating the vertex. The mother, no doubt, has been subjected to the risks of turning in addition to those of craniotomy, but we are surely warranted in incurring this additional risk in the hope, if successful, of saving the child.

Let us now examine shortly the positive advantages which are claimed by Simpson for the operation of turning in contracted pelvis. The biparietal measurement of the head is, as he points out, greater than the bimastoid; and as, in turning, the latter enters the contracted space first, he argues that, on obvious mechanical principles, the *compressibility* of the head is increased by version; and, as it is well known that in some cases of this kind, when the child has been born alive, the parietal bones have been found to be flattened, indented, or even fractured, he concludes that turning, under such circumstances, is not only a reasonable proposal but an actual gain in facility of delivery and safety to the child. He goes, however, too far, and attempts to prove too much, when he maintains, as a corollary to this proposition, that the effect of uterine contraction, when it forces a presenting head against a contracted brim, is to bulge outwards the biparietal poles, and thus increase the mechanical difficulty with the progress of labor. Simpson's theory has been contested by McClintock, E. Martin, and others, upon the whole, we think, unsuccessfully; while, in corroboration of his views, a considerable weight of practical evidence has accumulated, of which the following from Barnes's lectures is a striking illustration: "In the first place let me state a fact which I have often seen. A woman with a slight contracted pelvis, in labor with a normal child presenting by the head, is delivered, after a tedious delay, spontaneously or with the help of forceps; the head has undergone an extreme amount of moulding, so as to be even seriously distorted. The same woman in labor, again, is delivered breech first; the head exhibits the model globular shape, having slipped through the brim without appreciable obstruction. In the second place, I have, on several occasions, been called to an obstructed labor in which the head was resting on a brim contracted in the conjugate diameter. Of course nature had failed; the *vis a tergo* was insufficient. I have tried the long double-curved forceps, trying what a moderate compressive power, aided by considerable and sustained traction, would do to bring the head through, and have failed. I have then turned, and the head coming base first, has been delivered *easily*. Upon this point I cannot be mistaken."

The operation of turning in contracted pelvis may thus present itself to us under two distinct aspects—as a substitute for the long forceps and as a substitute for craniotomy. As regards the former, the experience of many independent observers would seem to show that, on the principle suggested by Simpson, turning may succeed when the forceps will fail; that instrument being, therefore, applicable to those cases only in which the contraction is moderate in degree. Owing to the difficulty of ascertaining the exact dimensions of the head and pelvis, a safe, and, we believe, a very general practice, is first to make a cautious attempt with the long pelvic-curved forceps, and failing that—which, in skilful hands, is a safer operation to the mother—to proceed at once to turn. Turning, as a substitute for craniotomy, is a more important point still—so important, indeed, in a conservative sense, that it cannot fail to command the attention of every conscientious practitioner. Impaction of the head, or difficulty of displacing it, so as to admit of the passage of the hand, and a degree of pelvic contraction beyond the limit which we have stated, are the two principal contraindications of the operation of turning. The death of the child is not necessarily so, for craniotomy at the brim is by no means so safe an operation but that it may fairly be balanced against turning, even in the interests of the mother alone.

The operator must be prepared, in turning in a contracted pelvis, to encounter special difficulties in individual cases, which it is impossible fully to describe, or even to anticipate. Following the example of all writers on the subject, we have alluded to the operation in reference only to simple conjugate contraction at the brim, by far the most common of all the varieties of distortion. It requires no argument to show that rules applicable to this alone must often fail. In the typical malacosteon pelvis, we may find an actual increase in the conjugate diameter, coupled with such deformity as may render craniotomy, or possibly the Cæsarian operation, the only practicable methods of delivery. In those cases in which there is asymmetrical distortion, it is of importance that the large or occipital end of the head should, if possible, be thrown into the larger half of the pelvis. To effect this is, however, a matter of very considerable difficulty; and, we apprehend that the rules laid down by E. Martin and others for effecting the object cannot be held as being of much practical value. The accoucheur must in no case lose sight of the infinite varieties of distortion to which allu-

FIG. 163.



Malacosteon pelvis.

sion has already been made, as these may at any time call for special adaptations, to which thorough operative capacity and an intimate knowledge of the subject can alone guide us. Another possible difficulty we have known to occur in connection with twin pregnancy, in which the operator, after introducing his hand, has seized the foot of the wrong child.

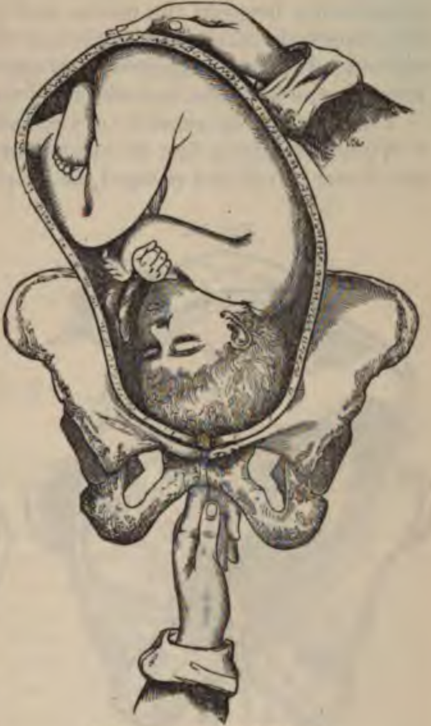
The operation to which alone we have hitherto alluded, is the ordinary operation of turning, necessarily involving the introduction of the whole hand within the cavity of the womb. There is, however, another operation, or rather a modification of this operation, which may be practiced with less risk to the mother, and even, as it would seem, under circumstances which would render the ordinary procedure difficult, if not impossible. This is *Bimanual* or *Bipolar Version*, an operation which is attracting, year by year, more and more of the attention which it merits. Early in the present century, Wigand suggested a method whereby the position of the child within the womb could be altered without risk to the mother, by external manipulation alone. His observation applied to transverse presentations only, and his plan was,—having ascertained, by vaginal examination, the exact position of the fœtus,—so to press upon the child externally as to bring to the os uteri that pole of its long diameter which was lowest in the pelvis. In a word, he claimed to be able to practice both cephalic and podalic version, without even introducing a finger into the vagina, although he seems to have employed the inner hand to guide or receive the head or breech into the os. The directions which he gives include elaborate, but, we fear, impracticable instructions as to the manner in which we should proceed—with the view of availing ourselves, to the utmost, of gravitation—to place the patient, now on one side, and again on the other, at various successive stages of the operation. It is quite certain that Wigand never contemplated anything more than partial version, so that his novel manœuvre, which found considerable favor in Germany, was never supposed to be applicable to cases of placenta prævia, or to any other case in which the head was originally the presenting part.

Dr. Robert Lee seems to have been the first to suggest a method of turning, which is the opposite of that to which Wigand lent the weight of his authority. In cases of incomplete dilatation of the os uteri, he brought two fingers, which he passed into the uterus, to bear upon the head, which he first of all attempted to displace, and, when he had succeeded in this, he successively pushed aside those parts which came opposite the os in the same direction as that in which the head had disappeared, until, ultimately, the feet were made to present, or were brought within reach of the finger, and so secured. We owe, however, to Dr. Braxton Hicks the method of combined external and internal version, which bids fair, in a great measure, to supersede the old method, and for the expediency of which we can unhesitatingly, and from personal experience, vouch. The conditions which have already been mentioned as favorable to ordinary podalic version, are even more essential to the successful performance of the bipolar method. Unless, therefore, the child is movable with tolerable freedom within the uterus, we can scarcely expect to succeed in effecting version by this, as we should probably fail by the other method. But, until we have thoroughly tried the effect of chloroform in reducing rigidity and tonic contraction of the uterine fibre, we should not too readily abandon the chance which this operation may possibly afford us, and we may be sure that if, at any stage, the conditions which are generally considered to be favorable to the ordinary operation are manifested, we may hope to succeed by this process. The operation of Braxton Hicks is, as will be inferred, a combination of the methods of Wigand and Lee, in the course of which, while the operator brings one hand to bear upon the uterus through the abdominal walls, he simultaneously operates upon the other end of the child by means of the finger, which he has introduced into the vagina and through the os uteri, causing the one pole to descend, as he encourages the other to recede.

In so far as transverse presentations are concerned, we are indebted to Dr. Robert Lee for having first clearly pointed out that when the child is situated quite transversely within the womb, its knee is generally within a finger-length of the os uteri, and thus in some transverse presentations it is not very difficult to hook down the knee. The child, however, as both he and Wigand have shown, does not usually lie transversely, but rather obliquely in regard to the transverse axis of the uterus, which removes the knee to some extent from the immediate grasp of the finger, and brings at the same time the operation of cephalic version somewhat more within the range of possibility. But while we thus recognize, as we can scarcely fail to do, the advantage of the bimanual method over either of those in which one pole only is acted upon, the former admits, as will be seen, of a far more extended application, such as was never sought to be accomplished, so far as we can see, either by Wigand or Lee. In cases of placenta prævia, therefore, or in cases of contraction of the brim, of not less than three inches in the conjugate diameter, the head being the presenting part, it is quite possible, and in some instances by no means difficult, to effect complete version by the bimanual method, and thus avoid many of the risks of the ordinary operation. For the details of this procedure we shall here quote the directions of Dr. Braxton Hicks.

"I will now proceed to describe the mode by which I effect podalic version. We will suppose a case where everything is natural; the os uteri dilated to admit one or two fingers, membranes perfect, and the face towards the right side. The patient may be placed in the ordinary obstetric position. Having lubricated my left hand, I introduce it as far into the vagina as is necessary, in order to reach a finger's length within the cervix. Sometimes it requires the whole hand, sometimes three or four fingers will be sufficient in the vagina. Having clearly made out the head and its direction, whether to one side or other of the os uteri, I place my right hand on the abdomen of the patient towards the fundus; I then endeavor to make out the breech, which is seldom a difficult matter. The external hand then presses gently but firmly the breech to the right side; as it recedes, so the hand follows it, either by gentle palpation, or by a kind of gliding movement over the integuments, while at the same time the other hand pushes up the head in the opposite direction, so as to raise it above the brim. It may be mentioned that, when the head has descended a considerable distance into the pelvic cavity, or more than half way through the os uteri, it is scarcely possible to lift it above the brim, especially if the uterus be active.

FIG. 164.



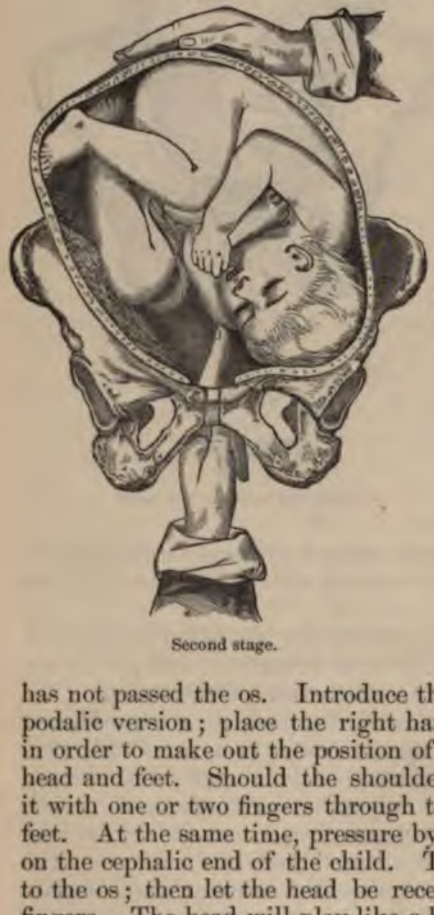
Bimanual version: first stage.

"When the breech has arrived at about the transverse diameter of the uterus, the head will have cleared the brim, and the shoulder will be opposite the os. That is pushed on in like manner as the head, and after a little further depression of the breech from the outside, the knee touches the finger, and can be hooked down by it. It very frequently happens, when the membranes are perfect, that, as soon as the shoulder is felt, the breech and foot come to the os in a moment, in consequence of the tendency of the uterus to bring the long axis of the child coincident with that of its own. Should it, therefore, be difficult to hook down the knee, depress the breech still more, and it will be almost always the case that the foot will be at hand.

"It will, sometimes, render turning more easy if, as soon as the head is above the brim, we pass the outside hand beneath it, and push it up from the outside alternately with the depression of the breech. All this can generally be performed in a much less time than I have taken to describe it, although in some it requires gentle, firm, and steady perseverance, with such a supply of patience as is always demanded in obstetric operations. If the os will only admit one finger, and the foot cannot be brought through in consequence, it can yet be retained at the os by pressing it with that finger against the inner surface of the os; the most convenient part being against the anterior part, because the pubes will assist in supporting the pressure, while, at the same time, in most persons, unless very stout, the hand pressing externally above the pubes is capable of assisting materially in retaining the leg in that position, and securing the altered change, ready for us to take advantage of it, should the case so require, as soon as the os dilates sufficiently; and the mere retention of the leg here is of considerable value, for, in cases of turning, even when we cannot effect turning immediately after having seized one of the limbs, yet the holding on to that part, and thereby fixing it, ultimately produces such an improved relationship between the uterus and its contents that the after operations succeed more easily. Should the child face towards the left side, the only difference required in operating is, that the breech be pressed towards the left side, and the head to the right."

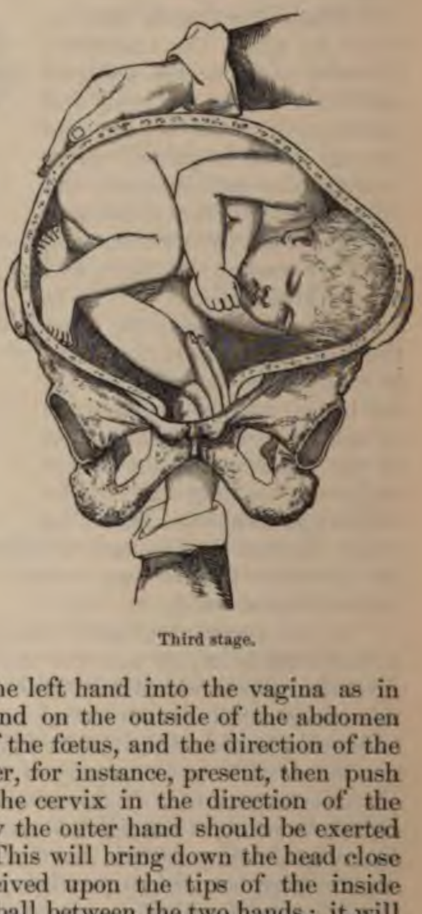
Further on, in regard to Cephalic version, Dr. Hicks continues: "We will suppose, first of all, a case where the uterus is not active, the liquor amnii not escaped, or only recently so, where the fœtal head has not passed the os. Introduce the left hand into the vagina as in podalic version; place the right hand on the outside of the abdomen in order to make out the position of the fœtus, and the direction of the head and feet. Should the shoulder, for instance, present, then push it with one or two fingers through the cervix in the direction of the feet. At the same time, pressure by the outer hand should be exerted on the cephalic end of the child. This will bring down the head close to the os; then let the head be received upon the tips of the inside fingers. The head will play like a ball between the two hands; it will be under their command, and can be placed in almost any part at will. Let the head, then, be placed over the os, taking care to rectify any tendency to face presentation. It is as well, if the breech will not rise to the fundus readily after the head is fairly in the os, to withdraw the hand from the vagina, and with it press up the breech from the exterior.

FIG. 165.



Second stage.

FIG. 166.



Third stage.

The hand which is retaining gently the head from the outside should continue there for some little time, till the pains have insured the retention of the child in its new position by the adaptation of the uterine walls to its form."[1]

We shall make no apology to the reader for the length of this extract and the prominence which we have thus given to the operation of bipolar version, as we look upon it as one of the most important improvements in modern obstetrics, which is attracting an amount of attention ever on the increase, and which is, if we mistake not, likely ere long to supersede, in a great measure, the more familiar procedure of ordinary podalic version.

CHAPTER XXXII.

EMBRYOTOMY.

CONDITIONS WHICH WARRANT THE OPERATION—CRANIOTOMY: CONSISTS OF VARIOUS STAGES—PERFORATION: VARIETIES OF PERFORATORS: METHOD OF, AND PRECAUTIONS TO BE OBSERVED IN PERFORATING—CRANIAL CONTENTS TO BE BROKEN UP AND DISLODGED—TRACTION TO BE NOW EMPLOYED—USE OF THE CROTCHET: WHERE TO FIX IT: DANGERS OF—THE GUARDED CROTCHET—THE CRANIOTOMY FORCEPS—REMOVAL OF THE VAULT OF THE CRANIUM—PROTECTION OF THE MATERNAL TISSUES—DAVIS'S OSTEOTOMIST—THE SCALP TO BE PRESERVED—TURNING AFTER CRANIOTOMY—CANTING THE BASE, AFTER REMOVAL OF THE FLAT BONES, AND BRINGING THE FACE DOWNWARDS—THE CEPHALOTRIBE: FRENCH AND ENGLISH MODELS—CEPHALOTRIPSY THE FINAL STAGE IN THE OPERATION OF CRANIOTOMY—DETAILS OF THE OPERATION—MAY THE CEPHALOTRIBE BE USED AS A TRACTOR? SUBSEQUENT EXTRACTION OF THE TRUNK—CRANIOTOMY IN BREECH DELIVERY, AFTER THE PASSAGE OF THE TRUNK—EMBRYULCIA: EVISCERATION OF THE FŒTUS: APPLICABLE CHIEFLY TO IMPACTED TRANSVERSE PRESENTATION—VAN HUEVEL'S FORCEPS SAW—DR. BARNES'S PROCESS OF CRANIAL SECTION BY THE ECRASEUR.

EMBRYOTOMY is, in one sense, the most objectionable of all the operations of Midwifery; for, of all other possible modes of procedure, this is the one which most certainly involves destruction of the child. On this account, the accoucheur shrinks, with natural repugnance, from an operation which necessarily involves mutilation of a dead, and must destroy a living child. Such, however, is a view which we are apt to carry to an extreme, and overlook, in so doing, the more important interests of the mother; while we forget that circumstances do arise, when, in full knowledge of the fact that the fœtus lives, it may be the duty of the accoucheur unhesitatingly to sacrifice the child, as this is the only means by which he may reasonably expect to save the mother.

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[1] On Combined External and Internal Version: by J. Braxton Hicks, M.D., F.R.S., &c., London. 1864.

Our first and earnest desire, of course, is to save, if it be possible, the child as well as the mother; but, if it should become obvious that all hope of a result so favorable must be abandoned, we may be sure that we are fully justified in giving up the child, if we recognize in this the only mode of preserving the more important life. Nothing, of course, will justify this, short of an absolute conviction that the vectis, the forceps, and turning, are of no avail; for then, and then only, are we justified in laying aside the implements of conservative midwifery, and taking into our hands agents which are destructive to the child. On the Continent generally, and especially in Roman Catholic countries, where the religious element comes more prominently into play, fœtal life is, it must be confessed, more jealously guarded than with us. But, while we fully recognize the humane impulses which may thus sway a purely scientific decision, it must be affirmed that, whenever it is certain that a living child cannot pass, nothing can be more irrational than to await death of the child, before we act upon the conviction that it cannot live, and thus allow the period to pass at which we may confidently operate, in the expectation of preserving maternal at the sacrifice of fœtal existence.

However lightly, on the other hand, we may view these considerations, evidence of the death of the child will always be held as of paramount importance, in all cases in which the operation of Embryotomy may offer itself for our consideration. When this is clear, all scruples will vanish, as we have the mother alone to consider; and, therefore, when the other modes of procedure are impracticable, we will proceed, without hesitation, to the performance of an operation which treats the dead fœtus as a mass of inert matter, to be removed at the least possible risk to the mother.

The conditions, then, which may be held as warranting the operation of Embryotomy are those in which the forceps and Turning are of no avail, and which, at the same time, preclude the passage of a living child. In so far as contraction of the conjugate diameter at the brim is concerned, we have already seen that, in the case of a fully developed child, we can scarcely expect a successful result from turning, when that diameter is much less than *three inches;* and this, therefore, we may take as the limit within which the operation may be demanded. Tumors of any kind,—bony, malignant, or ovarian; atresia of any portion of the ordinarily distensible canal; impaction of the head, or extreme contraction of the uterus, are illustrations of other causes which, independently of ordinary pelvic distortion, may render delivery by embryotomy the only method from which we can anticipate a favorable result. Although the history of former labors is, in such cases, to be admitted as an important consideration, in determining our course procedure, the conclusions of many independent observers show ver clearly that this must not be allowed to take too prominent a position, as it not unfrequently happens that women who have had an ordinary labor before, under circumstances which are apparently similar, are, if not relieved, subjected in subsequent labor to the greatest peril. This may be due, according to Barnes, to progressive pelvic contraction, or, as D'Outrepont holds, to progressive increase in the size of the children. But, on the other hand, we may fall into the opposite error, if Dr. Matthews Duncan's deductions are correct,—that after women have attained the age of twenty-nine, the weight of their children falls,—by supposing, that because craniotomy was found necessary on a former occasion, it must necessarily be required in subsequent pregnancies, which have been allowed to go to the full time. Among the rarer conditions demanding craniotomy, are impacted mento-posterior positions of the face, cases of locked twins in which one head can only be released by perforating and reducing the bulk of the other, double-headed monsters, and hydrocephalus.

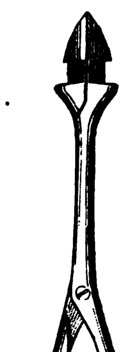
There are, however, in addition to these, certain conditions of the mother which may call for the operation. It has already been shown that, in cases in which, from any cause, speedy delivery is required, turning is to be preferred to the forceps, when the dilatation of the os is not sufficient to admit of the safe use of that instrument; and to this it may now be added, that an even less degree of dilatation of the os will suffice for craniotomy than for turning, as all that is essential is space for the introduction of two fingers and the extremity of the perforator. In cases, therefore, of convulsions, great exhaustion, and some instances of rupture of the uterus as already particularized, in which the state of the os forbids both the forceps and turning, it may be necessary for us to perforate. As a rule, however, and excepting the cases of rupture of the uterus alluded to, we should never operate by craniotomy while there is a possibility of nature prevailing, until we have given her a fair chance, and have waited to see what may be effected by the ordinary process of moulding.

The condition of the parts, or the stage of labor at which the operation should be performed is a matter of great importance, less perhaps in regard to the mere facility with which it may be effected than with reference to the safety of the woman. Although, as has been observed, a very moderate dilatation of the os is all that is essential, it affords great comparative facility to the operator, and proportionate safety to the mother, if the head is divested to a great extent of the covering which, in the early stage of labor, it derives from the lower segment of the uterus. It is of even greater importance that the head should have descended, to some extent, into the pelvis, and be within easy reach, for the operation upon a head which is still above the brim will be found, even under circumstances which are in other respects favorable, to be a very different operation from that in which it is arrested within the cavity of the pelvis. There are conditions, however, which may render a case manifestly impracticable, or which may admit of doubt; so that the peculiarities of individual cases must be our guide as to whether anything is to be gained by delay, and, if so, to what extent we are to maintain an expectant attitude. It is certain that we have less choice here as to the period which we may choose for the operation than obtains in regard to some of the other modes of procedure which we have described.

The Operation.—Embryotomy almost always involves craniotomy, so that the two terms are often used as synonyms. Craniotomy has been often euphemistically described as "lessening the bulk of the head." It consists of several stages, some of which may alone be required; or it may be necessary, before effecting delivery, to go through the whole of them, one after the other. We purpose, therefore, to explain these successive steps, as points in detail of one method of operative procedure, according to the degree of pelvic distortion, or other circumstances which may constitute the special impediment,—and including the use of the cephalotribe.

The first step in all operations of craniotomy is Perforation, and for this various instruments have been devised, which are termed perforators. The condition of the head, upon which its impact or resistance depends, is, in the first place, to be overcome, in order to permit of its collapse; and it is with this object solely that we perforate, and so act otherwise as to admit of the escape of the contents of the cranium, so that the forces, natural or artificial, may be brought to bear upon a part which is now susceptible of a considerable diminution in its diameters. The form of instrument which has by many Continental practitioners been preferred, is one which, in the principle of its construction, is almost identical with the ordinary trephine; but what is preferred and invariably used by English operators, is some modification of the perforating scissors of Smellie. The instrument here shown is that which was used by Simpson, and which generally bears his name. It consists of two blades with shoulder-stops, the blades, when in apposition, forming a triangle of which the base is at the stops, with cutting edges, converging to a point, which is the apex of the triangle. The instrument is thus one which is to be used with the greatest possible caution, lest injury should be inflicted upon the soft parts of the mother. When the blades are separated by pressing the handles together, a powerful spring between the latter causes them to close so soon as the grasp is relaxed. Its mode of application is as follows. The ordinary preliminaries to the other operations of midwifery having been carefully observed, the woman is to be placed, as usual, upon her left side. Two fingers of the left hand are then introduced into the vagina, and brought to bear upon the most depending portion of the vault of the cranium. With the greatest possible caution, the blades are then to be passed along the palmar aspect of these fingers, which serve as a guard to the maternal parts, until it reaches

FIG. 167.



Simpson's perforator.

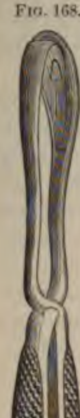
the surface of the cranium, through which it is thrust by a combined pushing and boring movement as far as the stops. While this is being effected, particular attention should be given, so that the force be applied at right angles to the surface against which it impinges, otherwise the point is apt to glance off, and may seriously wound the mother.

Some have advised that perforation should be effected at the sutures or fontanelles; but, although this renders the operation somewhat easier, the disadvantage is that the subsequent collapse of the head, by overlapping of the flat bones of which its vault is composed, will necessarily obliterate the aperture, and impede the escape of the cerebral tissue. It is, therefore, much better that we should perforate the parietal bone which presents; and, when this has been done in the manner described, the handles are pressed together and the blades separated. This, by tearing asunder the parts, makes a lacerated and irregular gap in the cranial walls; but, in order to render the aperture more patent, and thus facilitate the escape of the contents, the handles are turned so as to bring the blades half round, and another similar incision is made at right angles to the first. The perforator is then to be thrust into the cavity of the cranium, and freely moved about in all directions so as to break up, as far as is possible, cerebrum, cerebellum, and membranes; and if the child is alive, it will be proper to pass it in the direction of the medulla oblongata, so as to cause its death, as cases have occurred in which, after perforation and escape of the greater portion of the cerebrum, the child has been born alive. The perforator is then to be removed with the same precaution as was observed on its introduction. If the breaking up of the brain has not been satisfactorily accomplished, this may be completed by the crotchet, which, indeed, some operators prefer altogether for this purpose, withdrawing the perforator so soon as the breach in the cranial walls has been completed.

Complete disorganization of the textures within the cranium does not necessarily imply their immediate expulsion, which can alone insure compression of the cranial vault. This, no doubt, has already been in a great measure effected by the nature of the aperture which we have made in the parietal bone; but, unless uterine action is present, and can act efficiently upon the cranium, the amount discharged, even through a considerable gap, may be but trifling. In order, therefore, to encourage compression, and the consequent diminution of the cranial diameters, it has been suggested that we should extract the brain-substance; and this may be effected without danger, and with more or less of success,—which will be proportionate to the thoroughness with which the cerebral disintegration has been effected,—by a scoop or spoon, or by the injection within the cranium of a powerful stream of water. So soon as a large portion of the cerebral contents has been permitted to escape, the bones of the skull will collapse under the influence of very trifling compression. This, however, may completely fail, whence arises the necessity of proceeding to another stage of the operation.

If nature, after complete decerebration, fails to effect some advance of the head, it will then be proper to attempt delivery by traction exercised upon any part of it where a secure hold may be maintained. The ordinary crotchet, described in a former chapter (see Fig. 160), is the instrument which was exclusively employed in ancient times, and even in the present day is frequently resorted to. The idea here is to fix the crotchet upon any part of the bones, and, if possible, at the foramen magnum, or the Sella Turcica, where the best and most effective grip may be had, with the least risk of slipping. The directions which are very generally given by the older writers for the employment of the crotchet after perforation, for the purpose of traction, seem to point to fixing it upon some point on the inner surface of the parietal bone, and having thus secured a good hold, to drag steadily downwards. The great objection to the use of the crotchet in this way is that it is always unsafe, and, in the hands of the inexperienced, eminently so. No one uses the crotchet for this purpose, unless he has previously passed up the finger of one hand in order to protect the soft parts from the possible effects of a sudden and unexpected detachment of the instrument, which, under other circumstances, would probably inflict upon the mother severe, and possibly dangerous laceration. As it is often difficult efficiently to protect the parts by means of the finger, an instrument called the "guarded crotchet" has been devised. It is variously constructed, but consists essentially of two blades, or rather of a crotchet and a protecting blade. In that which is here shown, the crotchet has three sharp teeth, and is furnished with the ordinary forceps joint, by which it is articulated with the protecting blade. The crotchet, being introduced within the cranium, is fixed in the ordinary manner, and the guard being then passed in the usual way outside of the scalp, the instrument is locked, which, so long as this relative position is maintained, prevents all possibility of laceration by the sharp part of the instrument.

Fig. 168.



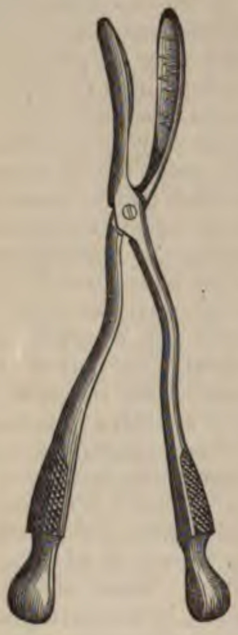
Guarded crotchet.

The danger to the mother is, however, in point of fact, less from the crotchet itself, than from the fracture and sudden displacement of the bones to which it is attached. Should the tractile force be trifling, the hold which the crotchet gives us may be maintained; but if, as is more generally the case, we are obliged to use a considerable degree of force the crotchet often slips either from its attachment, or by reason of fracture of the bone. It is on this account that the guard of the crotchet cannot alone be trusted to, and we must therefore pass up the finger, which should be retained in apposition with the head so long as our efforts may last, so that we may at once perceive the earliest indication of slipping, and adopt such precautions as may be necessary for the protection of the maternal structures.

The Craniotomy Forceps is, as now constructed, an instrument which is greatly superior to the crotchet either single or guarded, and is applicable to almost all cases in which the latter has been applied. When perforation, with evacuation of the cerebral contents, has been completed, and it is found necessary to proceed to the further stages of the operation, the blades of the craniotomy forceps are to be applied, one within and the other without the cranium, that which is convex on the outside being for application over the scalp. It will be observed that one blade is fitted with sharp teeth corresponding to pits or depressions upon the opposed surface of the other. When suitably adjusted, therefore, all that the operator has to do is to press the handles together with some force, which will insure a grasp upon the wall of the cranium, over a more extended area, as well as more firmly, than can, under any circumstances, be effected by the crotchet. The handles being firmly bound together, traction must now be practiced in the direction which may be proper to the actual position of the head. If the bone gives way, the detached portions must be cautiously removed, and a fresh hold obtained wherever the parts may seem most likely to bear the strain; but, when the resistance is great, it will soon become evident that this method of extraction will fail, and we must therefore pass to a more advanced stage still of the operation of craniotomy.

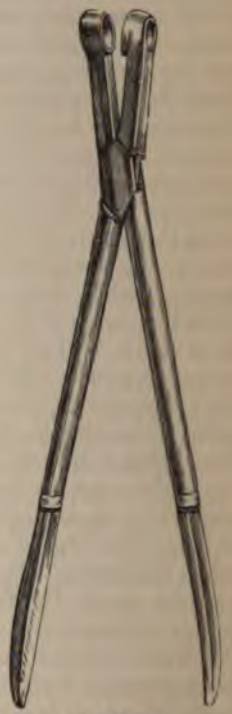
The process which, under such circumstances, is rendered necessary, is the deliberate removal in detail of the flat bones, which require for this purpose to be broken up into pieces of convenient size, in order that the whole vault of the cranium may be thus removed, including, in extreme cases, the occiput and the forehead. No part of the operation requires more caution than the removal of the fractured portions of the bones, which are often jagged and splintered, and always sharp at the edges, so much so, sometimes, as to cut through the cuticle of the fingers of the operator, which may afterwards be observed to be scarred as if by the edge of a sharp knife. When a fragment of bone becomes detached, in an attempt at extraction either by the crotchet or craniotomy forceps, it is always better to remove it at once, and for this purpose the finger will generally suffice. When our object is to remove the whole cranial vault, the bones are, in the first place, to be broken and separated from their attachments within the scalp—a part of the operation which is best effected by means of the craniotomy forceps. In this case, however, we introduce the blades somewhat differently, passing the outer blade between the scalp and the bone, so that the latter is directly grasped. A smart wrench by the wrist is generally all that is necessary to fracture the bone, when the severed portion which remains between the blades may be removed by the aid of the instrument. Much will, however, depend upon the shape of the fragment, which is to be carefully ascertained by the finger acting in concert with the forceps. If it is very irregular in shape, it will, of course be all the more difficult to protect the soft parts of the mother from so many cutting surfaces, and it may be necessary to divide it again before attempting extraction. The mode of grasping the fragment must also be attended to, so as to bring elongated portions lengthwise, and in many similar ways we may reduce risk by careful manipulation. Dr. Davis was so impressed with the danger which attends the removal of the fractured cranial bones that he devised an instrument, or rather a series of instruments, which he termed Osteotomists, by which the bones could be more safely removed. One of them is here shown. It is of the nature of a powerful punch, by which successive minute portions of the bones may be nipped off and removed in the grasp of the blades, thus completely protecting the soft parts. Such an operation was necessarily a very tedious one, and this is probably the reason why this instrument was never much employed, and has latterly fallen into

FIG. 169.



Craniotomy forceps.

FIG. 170.



Osteotomist.

complete disuse. We have found it to be extremely useful in cutting any spiculæ or sharp angular projections which may seem to threaten laceration, and for this reason we look upon it as a most useful aid to have at hand when we have to perform the operation of craniotomy. By dexterous management, however, we may generally succeed in safely removing much larger pieces of bone by the fingers than can be effected by the osteotomist.

In removing the vault of the cranium, it is proper to preserve the scalp. The object of this is to protect the maternal parts from injury. It may happen, after a certain amount of progress has been made, and a considerable portion of the vault removed, that the head collapses to such an extent that the difficulty is got over, and extraction becomes easy. In such a case the scalp is used as a covering for the bones which remain, and as a protection from spiculæ and sharp edges, which might otherwise do mischief.

If at any time in the process of removing the bones, or even earlier, we are able to seize the forehead by the craniotomy forceps and pull it down, this should always be done; but the difficulty in extreme contraction is that the vault of the cranium is not yet sufficiently compressible. It is mainly, therefore, with the object of ultimately bringing down the forehead, which usually lies to the right side, that we thus pick away the bones until there remains, when it is complete, nothing but the scalp.

There is one method of procedure which is not often resorted to, but which, in some instances, is of undoubted efficiency after perforation. This is the ordinary operation of Turning, which may sometimes be effected without much difficulty, when, by the perforator, we have reduced the bulk of the child's head. To attempt this in cases of very great distortion would, on many grounds, be improper; but in more moderate disproportion, it is sometimes an efficient and valuable method of completing delivery. A striking instance of this kind, which we saw with Drs. Lyon and Dick, was that of a woman in whom it had been found necessary to perforate in consequence of very considerable conjugate contraction. Traction with the craniotomy forceps was found to be insufficient, and failed to dislodge the head of the child. A considerable portion of the bones was then removed, but before entirely removing them, and proceeding to the more advanced stages of the operation, to be described immediately, an attempt was made to turn, when, the foot being brought within reach, this was effected without the slightest difficulty. In all such cases it is of the first importance that the scalp should cover the fractured bones, and we should, therefore, be particularly careful that this should be insured before we attempt to turn.

The flat bones being removed, the next question for consideration which presents itself is one which, without a thorough knowledge of the fœtal and maternal parts, could not fail to give rise to much doubt and apprehension. What remains behind of the head consists entirely of the base of the cranium, a part which, even at this early age, is very solid and unyielding, in order to afford protection to the vital structures which might otherwise be subjected to dangerous or fatal pressure. The shape of the base of the skull is that of an irregular ovoid disk, the long diameters of which are across the pelvis. It would seem, therefore, at first, as if no great advantage had been gained by the removal of the flat bones, but a moment's consideration will show that a very simple manœuvre, and one which is generally easy of performance, will suffice to place what remains of the head much more favorably. "I have carefully," says Dr. Burns, "measured these parts, placed in different ways, and entirely agree with Dr. Hull, a practitioner of great judgment and ability, that the smallest diameter offered is that which extends from the root of the nose to the chin. For, in my experiments, after the frontal bones were completely removed, and the lower jaw pressed back, or its symphysis divided, so as to let its sides be pushed away, this did not, in general, exceed an inch and a half. It is, therefore, of great advantage to convert the case into a face presentation." The practice thus recommended by Burns was at an earlier date upheld by Dr. Osborn, who was the first clearly to show that, by *canting* the base of the skull, so as to bring it edgewise into the brim, it was perfectly possible to deliver a full-sized child through a conjugate diameter measuring an inch and a half only. A very remarkable case—that of Elizabeth Sherwood—was detailed by Dr. Osborn, and has been quoted by many subsequent writers. This case, which is specially interesting as bearing upon the question which we are now considering, may here be advantageously detailed in a very abridged form.

The patient was so deformed, both in her spine and her lower extremities, "as never to be able to stand erect for one minute without the assistance of a crutch under each arm." At the age of twenty-seven she became with child, and was admitted a patient into Store Street Hospital, where she was seen by W. Hunter, Denman, and other eminent obstetricians of the day, who gave their sanction to the course of procedure which Osborn ultimately adopted with such remarkable success. Dr. Osborn describes his first examination as follows: "Immediately upon the introduction of the finger, I perceived a tumor, equal in size, and not very unlike in feel, to a child's head. However, it was instantly discovered that this tumor was formed by the basis of the sacrum, and last lumbar vertebra, which, projecting into the cavity at the brim, barely left room for one finger to pass between it and the symphysis pubis, so that the space from bone to bone at that part *could not exceed three-quarters of an inch.*" The operation which was determined upon (a decision which gave rise afterwards to no little discussion) was to effect extraction by the perforator and crotchet. "Even the first part of the operation, which in general is sufficiently easy, was attended with considerable difficulty, and some danger. The os uteri was but little dilated, and was awkwardly situated in the centre and most contracted part of the brim of the pelvis. The child's head lay loose above the brim, and scarcely within reach of the finger, nor was there any suture directly opposite to the os uteri." The operation of perforation and decerebration was effected without anv unusual difficulty, and the patient was then left, as was the general practice in these days, for six-and-thirty hours, in order to allow the uterus opportunity to force the cranium downwards as far as possible within the reach of the crotchet, a result which was counted upon to some extent as the effect of putrefactive change.

"I determined," he continues, "to begin to make an attempt to extract the child. *I call it an attempt, for I was far from being satisfied in my own mind of the practicability.*" My first endeavors were bent to draw the os uteri with my finger into the widest part of the brim of the pelvis, and to dilate it as much as possible. But the removal of the os uteri, and such dilatation of it as the bones admitted, were effected without much trouble. I then introduced the crotchet through the perforation into the head, and by repeated efforts, made in the slowest and most cautious manner, destroyed almost the whole of the parietal and frontal bones, or the whole upper or presenting part of the head; and as the bones became loose and detached, they were extracted with a pair of strong forceps, to prevent, as much as possible, laceration of the vagina in their passage through it The great bulk of the head, formed by the base of the skull, still, however, remained above the brim of the pelvis; and from the manner in which it lay, it was impossible to enter without either diminishing the volume, or changing the position: the former was the most obvious method, for it was a continuation of the same process, and, I trusted, would be equally easy in execution. I was, however, grievously mistaken and disappointed, being repeatedly foiled in every endeavor to break the solid bones which form the basis of the cranium, the instrument at first invariably slipping as often and as soon as it was fixed, or, at least, before I could exert sufficient force to break the bone. At last, however, by changing the position of the instrument, and applying the convex side to the pubis, I fixed the point, I believe, into the great foramen, and by that means became master of the most powerful purchase that the nature of the case admitted.

"Of this I availed myself to the utmost extent; slowly, gradually, but steadily increasing my force till it arrived at that degree of violence which nothing could justify but the extreme necessity of the case and the absolute inability, in repeated trials, of succeeding by gentler means. But even this force was to no purpose, for I could not perceive that I had made any impression on that solid bone, or that it had been in the least advanced by all my exertions I became fearful of renewing the same force in the same way, and therefore abandoned altogether the first idea of breaking the basis of the cranium, and determined to try the second by endeavoring to change the position. I, therefore, again introduced the crotchet in the same manner, and fixing it in the great foramen, got possession of my former purchase; then, introducing two fingers of the left hand, I endeavored with them to raise one side of the forepart of the head, and turn it a little edgeways. Immediately and easily succeeding in this attempt, the two great objects were at once accomplished; for the position was changed and the volume diminished. Continuing my exertions with the crotchet, I soon perceived the head advance, and, examining again, found a considerable portion of it had been brought into the pelvis. Every difficulty was now removed, and, by a perseverance in the same means for a short time, the remaining part of the head was brought down and out of the os externum."

We cannot wonder that the result in this case, and the satisfactory recovery of the mother, should have been looked upon as a great triumph of the crotchet as compared with the otherwise inevitable expedient of the Cæsarian Section. Of late years this question has been more thoroughly investigated and illustrated. Dr. Braxton Hicks, in a learned and elaborate paper,[1] describes very fully the mechanism of the proceeding. What he recommends is to grapple the orbit and draw it downwards by means of a small blunt hook. "The one which I use," he says, "is of the following size: the diameter of the iron rod from which it is made is about a quarter of an inch, of the length of the ordinary blunt hook; with handle also alike. The hook is a half circle about one inch in diameter, and is made hard, to prevent its opening during traction; the shaft is made of soft iron, and can be bent by the hand into any form, being thus adaptable to any situation. I may mention here that this hook is useful, in other cases, in a variety of ways, where it is impossible to employ the unwieldy blunt hook in general use."

Dr. Barnes, after removing the arch of the calvarium, or the whole of the bones if the distortion be extreme, prefers, for effecting the same object, the craniotomy forceps. The instrument which he uses is of considerable strength, and is provided with a screw at the ends of the handles, which secures for it the ordinary advantages of the cephalotribe, by crushing in the frontal bones, and has the further advantage of securing an unyielding hold. "Then traction is made, carefully backwards at first, in the course of the circle round the false promontory. As the face descends it tends to turn chin forwards, and this turn may be promoted by turning the handles of the instrument. It is not necessary that the turn should take place, for the case differs entirely from that of the normal head. There is no occiput to roll back upon the spine between the shoulders. The head comes through flatwise like a disk by its edge."

The above extracts, which represent the most modern and scientific modes of practice, will suffice to show that where the pelvis measures *two inches*, or even a little less, in the conjugate diameter, a fully developed child may yet possibly be extracted. It is obvious, however,—the transverse diameter of the face being more considerable,—that, to insure success, there must be a larger space, certainly not less than three inches, in the transverse diameter. "I go further," says Barnes, in reference to this operation, "and declare that it is perfectly unjustifiable to neglect this proceeding, and to cast the woman's life upon the slender chance afforded by the Cæsarian Section."

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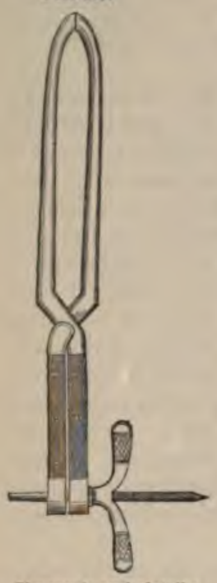
[1] Obstetrical Transactions, vol. vi, 1865, p. 263.

The Cephalotribe.—If the facts and arguments above cited are strictly correct, the number of cases in which the cephalotribe is called for are probably very limited in number. They are certainly much more so than was at one time supposed. The earliest instrument designed for crushing the bones of the fœtal skull seems to have been the Compressor Forceps of Assolini, which was used by him to crush the base of the skull and the face, early in the present century. The blades of this instrument were not made to cross, so that when they were screwed together, the fulcrum of each lever was the joint at the end of the handles, where they were articulated. The only modern instrument resembling this in principle is the cephalotribe of Lazarewitch of Charkoff. What, with certain modifications, is known as the French cephalotribe, was invented by the younger Baudelocque. It is, in appearance, a most formidable instrument; the one in our possession weighing no less than 4 lbs. 6½ oz., and measuring across the blades nearly 2 inches, in the widest part. It requires, therefore, no argument to show that such an apparatus is not applicable to a case such as that of Elizabeth Sherwood. Various modifications have, in modern times, been designed by Scanzoni, Braun, Simpson, and others, almost all of which are constructed with a moderate degree of pelvic curve. They are all made lighter than the original instrument, as it has been found that clumsiness may be, to some extent, avoided without any material sacrifice of strength. The tendency of the English instruments is to approach more in form to the ordinary midwifery forceps, as is well shown in Simpson's cephalotribe, which is here represented.

FIG. 171.

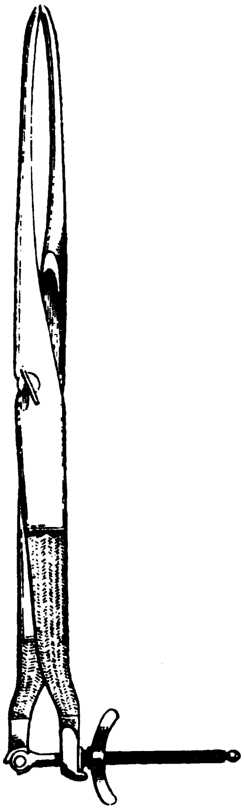


Simpson's cephalotribe.

As in the case of the forceps, there has existed in this country some controversy as to whether the pelvic curve should or should not be adapted to the cephalotribe, those who approve of the straight instrument arguing with some force that the straight blades are easier of application, and can alone be properly applied when we wish to rotate. The fact that the head is at the brim seems to us, on the contrary, to vindicate, on the same grounds which have been urged with reference to the long forceps, that unless we are, as Pajot and some others advise, absolutely to discard the instrument as an extractor, we must admit that the principle of the pelvic curve must be conceded here also. The objections which Dr. Kidd and others have urged against the pelvic curve have, however, so far prevailed that the English instruments are all, without exception, made with a slighter curve than the French ones.

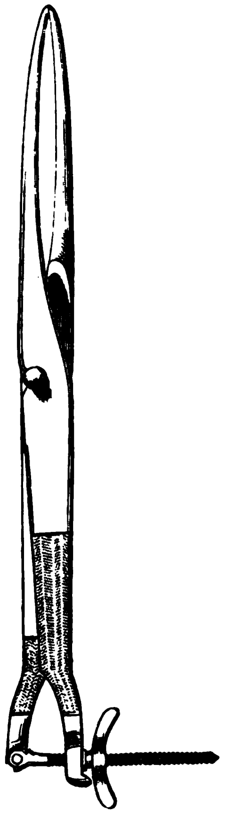
The French cephalotribes still retain, as we have said (and, we may add also, the German modifications of Braun and Scanzoni), much of the original formidable dimensions of the instrument. We might have ted ourselves with the mere mention of this fact were it not that years some able obstetricians have condemned the English instru- and insisted that we should do better to adhere more closely to h models in the construction of cephalotribes. Dr. Matthews

FIG. 172.



French cephalotribe.

FIG. 173.



Dr. Matthews Duncan's cephalotribe.

n, assisted by Professor Inglis of Aberdeen, and some others, some very interesting experiments with a view of comparing the of Simpson's cephalotribe and the more modern of the French ments. The experiments were performed on fœtal crania, and on ulls of dogs, and certainly served very clearly to demonstrate e French cephalotribes have greater power. Are we, therefore, t account, to prefer them, to the exclusion of those with shorter s?

reply to this question, Dr. Duncan expresses a decided preference French cephalotribe, a modification of which he has devised, so ombine the lesser degree of pelvic curve which is characteristic glish instruments, with certain other modifications which he con- as offering some advantage. Dr. Duncan's cephalotribe is here represented. Drs. Barnes and Braxton Hicks are again warm supporters of what we have termed the English cephalotribe, and while they do not assert that the crushing force is equal to that of the French instrument, they maintain that the power is attained in sufficient perfection for the object which we have in view, and that there is a gain in the facility of handling, which may be held as sufficient to counterbalance any trifling loss of power.

We have at present to consider the subject of Cephalotripsy as the final stage of the operation of craniotomy in cases of great pelvic contraction. Perforation, decerebration, removal of the flat bones, and canting edgewise of the base of the skull have all, we shall suppose, been successively tried, but to no purpose. Can anything further, we ask ourselves, be done in this same direction?—a question which finds its reply in the operation which we are now considering. The object of the instrument is, as its name implies, to crush the unyielding base into a pulp, and thus bring it through the contracted diameters. The blades are introduced, in the same manner as those of the ordinary long forceps, in the direction in which there is least resistance, which will generally be the sides of the pelvis. They are passed high up, so as to reach quite beyond the base, which it is our object to crush; and, being adjusted, the screw is then turned steadily and cautiously, while the finger within the vagina takes note of what is being done, and is ready to remove at once any spiculæ of bone which may crop up under the influence of the crushing force. Whatever form of instrument we may choose, it should be one which does not measure, when closed, more than an inch and a half outside the widest part of the blades. This admits, therefore, of such crushing as may enable the head to pass through a diameter which may be contracted to that extent. If the deformity is great, a second crushing may be necessary, and for this purpose, the blades should be removed and reintroduced, so as to secure a grasp which should be, as nearly as possible, at right angles to the first.

It must not be supposed that it is only to cases in which the whole of the flat bones have been already removed that the operation of cephalotripsy is applicable. On the contrary, it may often be used with advantage when only a portion of the vault has been got away. This is generally sufficient to admit of the easy introduction of the blades, so that, if unusual difficulty is experienced in extracting the bones, and the head refuses to advance under steady traction, the operation will have the double effect of crushing the base and permitting the collapse of the skull, and complete escape of all its contents. In this case, however, we should watch with special caution the effect of the compression upon the cranium, otherwise the maternal parts may, at any moment, be wounded by fragments of the tabular bones.

A subject which has given rise to no little discussion, is whether or not we should, after crushing, use the cephalotribe as a tractor. Pajot condemns such a course, and recommends a procedure which he describes as "*cephalotripsie répétée sans tractions*," in which he leaves expulsion absolutely to nature. He also recommends, what, if feasible, is certainly advantageous—that we should rotate the head which has been operated upon, so as to bring its crushed diameter in relation with the contracted diameter of the pelvis. This condemnation of the cephalotribe as a tractor, seems chiefly to be supported by those who, in France or elsewhere, uphold the use of the bulky instruments which are very obviously less suitable for such a purpose. What seems, therefore, to be the chief advantage of the lighter English instrument, is that traction may by it be more safely performed. Indeed, it appears to us in the highest degree irrational that we should forego all the advantages of traction which spring from such a firm grasp of the head as the cephalotribe gives. Caution, indeed, we can scarcely exaggerate; but, we can see no reason why, after efficient crushing, we should not pull gently with the handles backwards, which we can, of course, do with more safety, and at greater advantage than if there was no pelvic curve to the blades. Another disadvantage of removing the blades, and leaving the further progress of the case to nature is said by Dr. Barnes to consist in the resiliency of the fœtal structures; so that a head so flattened within the grasp of the cephalotribe as to measure not more than an inch and a half, may spring out on the removal of the blades to more than two inches.

When the mutilated head at length glides through the chink which has so obstinately barred its progress, the young operator may hastily conclude that his operative difficulties are necessarily at an end. In cases of minor disproportion, it will no doubt be so; but, in extreme distortion, the descent of the shoulder and trunk may be attended with very considerable difficulty. If the remains of the head be still within the grasp of the cephalotribe, it is proper to continue the tractile force backwards, as far as may be practicable with a due regard to the integrity of the perineal structures. This is done with the view of disengaging the anterior shoulder, or bringing it a little in advance, so that the blunt hook may be fixed in the axilla to pull it through. It may be necessary at this stage, when the blunt hook and crotchet fail to effect delivery, that the cephalotribe should be again used, and the trunk crushed prior to delivery; a proceeding which, although rarely necessary, is certainly preferable to the employment of such violence as might otherwise endanger the tissues of the mother.

There are cases in which it is found necessary to lessen the bulk of the head in breech presentations, or after turning, the head being arrested after the trunk has been successfully disengaged from a contracted pelvis. In this case the conditions of the operation are inverted, but are not by any means, as a rule, more difficult. Perforation may be effected behind the ear, and this situation should be selected as the point at which we may most readily attain the cavity of the cranium, and give exit to the brain-substance, so as to permit of the collapse of the head. In this case, also, the cephalotribe may be employed with great advantage by crushing the base of the skull, which, in this instance, is in advance of the vault; and if the measurements are such as to have already admitted of turning, or of the descent of the breech, we may be almost sure that the collapse of the head, which must now necessarily ensue, will amply suffice to permit of its passage through the pelvis.

Embryulcia.—When some part of the child other than the head presents, it may be necessary to use the perforator upon the trunk, and endeavor to extract the child by the evacuation of the contents of the thorax and abdomen. This is one of the methods, for example, which have been practiced in cases of transverse presentation in which turning is impracticable. There is no difficulty in such a case in making a breach in the thoracic walls, below the axilla, of sufficient size to admit of the removal of the lungs and heart, and subsequently, by perforation of the diaphragm, of the abdominal viscera—the most important of these being the liver, which, as is well known, is of great size in the fœtus. The breaking up of the organs prior to their removal cannot be effected in the same bold manner as in craniotomy, as we might easily perforate the trunk, and wound the walls of the uterus. After thus reducing the bulk of the trunk, what should now be attempted is an imitation of the natural processes of spontaneous evolution, or spontaneous expulsion, which may be effected by forcibly dragging down the breech, by the blunt hook or otherwise, after the organs have been removed. This, however, is not always easy; and we have a vivid recollection of such a case, which we saw many years ago, where turning had been found impracticable, and embryulcia had been practiced to the extent of removing the whole of the abdominal and thoracic organs. The crotchet and blunt hook were repeatedly fixed upon the pelvis and lower vertebræ, but without success, and the woman ultimately died undelivered. Looking back upon this case with the vividness with which memory recalls early experiences, we feel assured that the treatment proper to it ought to have been decapitation, and not evisceration.

The former operation has been described in a previous chapter, and should, we believe, be always taken into consideration when the question of embryulcia in impacted transverse presentation crops up. Evisceration is not, however, limited to cases of transverse presentation, but may be found necessary, and has often been practiced as a sequel of craniotomy, when it may be requisite to diminish the bulk of the trunk, on precisely the same principle as has guided us to perforation of the cranium at an earlier stage of the operation, where we cannot succeed in delivering by the blunt hook, crotchet, or any other instrument which we may employ purely for the purpose of traction. It is probable, however, that under such circumstances the process previously detailed, in which the cephalotribe is the agent employed, might be adopted with a better prospect of satisfactory results.

A very powerful instrument, but one rather complicated in its construction, is that which was invented by Van Huevel, of Brussels, and has subsequently been adopted by some eminent Continental practitioners as a substitute for the crotchet, cephalotribe, and other instruments which we have described as essential to the performance of craniotomy, under any circumstances which may involve greater difficulty than usual. This instrument is known as Van Huevel's Forceps Saw, and consists in the first place of forceps, of which the blades are of unusual strength. On the inner aspect of the latter is a groove extending from about one inch below the extremity to near the joint. Within the groove, and protected by a band of steel, the chain saw is introduced after the blades have been adjusted, and is then made to cut from without inwards, or from the lock towards the tips of the blades, until the head has been divided—the chain being worked by two small cross handles at its extremities, while its action, protected by the blades of the forceps, may be looked upon as absolutely safe.

Dr. Barnes has lately suggested another operation, by which the wire écraseur may be used for the purpose of bisecting the head, or otherwise operating upon the body of the fœtus. This method of performing Embryotomy was demonstrated by the inventor before the Obstetrical Society, the instrument employed being the écraseur of Braxton Hicks. He recommends the employment, not of the wire rope suggested by Hicks,[1] but of a single loop of strong steel wire, which he manipulates, so as to pass it through the cervix uteri and the chink of the pelvic brim. The crotchet being passed into the hole made by the perforator, and held by an assistant, so as to steady the head, the loop is guided over the crotchet to the right side of the uterus, where the face lies. "The compression being removed, the loop springs open to form its original ring, which is guided over the anterior part of the head. The screw is then tightened. Instantly the wire is buried in the scalp; and here is manifested a singular advantage of this operation. The whole force of the necessary manœuvres is expended on the fœtus. In the ordinary modes of performing embryotomy, as by the crotchet especially, and in a lesser degree by the craniotomy forceps and cephalotribe, the mother's soft parts are subjected to pressure and contusion. The child's head, imperfectly reduced in bulk, is forcibly dragged down upon the narrow pelvis, the intervening soft parts being liable to be bruised, crushed, and even perforated. All this danger, obviously increasing in proportion to the extent of the pelvic contraction, together with the bulk of the instruments used, deprives the mother, in all cases of extreme contraction, of the benefit of embryotomy, leaving her only the terrible prospect of the Cæsarian section. When the anterior or posterior segment of the head is seized in the wire-loop, a steady working of the screw cuts through the head in a few minutes. The loose segment is then removed by the craniotomy forceps. In minor degrees of contraction, the removal of one segment is enough to enable the rest of the head to be extracted by the craniotomy forceps. But in the class of extreme cases, in which this operation is especially useful, it is desirable still further to reduce the head by taking off another section. This is best done by reapplying the loop over the occipital end of the head."

A word may here be added as to the probable range of cases within which the cephalotribe may be applied. Much will, of course, depend, as has already been observed, upon the degree of contraction, not only of the conjugate but of the other diameters of the pelvis. In a discussion on this subject, held at Berlin, the majority of the speakers thought that a minimum of two inches in the conjugate diameter was necessary. Credé, Pajot, Hicks, and Barnes have, however, encountered cases in which the contraction ranged from one and three-quarters to one and a half inches, and have yet been able successfully to accomplish the operation. It is important that facts such as these should be borne in mind when we have to consider the *dernier ressort* of operative midwifery—the Cæsarian Section—which will form the subject of the following chapter.

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[1] We have frequently employed this instrument for the removal of uterine polypi, and in other similar operations, but have found that the wire ropes suggested by the inventor are not to be depended upon, and are apt to snap under a powerful strain. Thinking at first that this was due either to some imperfection of the instrument, or to some fault in the annealing of the wire of which the rope was composed, we consulted Dr. Hicks, who was so obliging as to order a complete instrument and ropes, after his own model; but the result was still far from satisfactory. From the experience we have since had of the single steel wire suggested by Dr. Barnes, we are inclined to give to it a decided preference.

CHAPTER XXXIII.

HYSTEROTOMY AND ALLIED OPERATIONS.

HISTORY OF THE OPERATION OF HYSTEROTOMY—CASES IN WHICH IT IS JUSTIFIABLE: MATERNAL MORTALITY: DIFFERENT RESULTS IN BRITISH AND CONTINENTAL PRACTICE—CONDITIONS FAVORABLE TO SUCCESS—THE OPERATION AND ITS DETAILS: DUTIES OF THE ASSISTANTS: CLOSURE OF THE WOUNDS—AFTER-TREATMENT—CAUSES OF FATAL RESULT—EFFECT OF COLD IN PREVENTING PERITONITIS—REPEATED SUCCESS OF THE OPERATION IN THE SAME CASES—GASTROTOMY: CASES IN WHICH THE OPERATION IS REQUIRED—THE SO-CALLED VAGINAL CÆSARIAN SECTION—SYMPHYSIOTOMY: HISTORY AND NATURE OF THIS OPERATION: OBJECTIONS TO IT—STOLTZ'S OPERATION OF PUBIOTOMY—TABULAR STATEMENT SHOWING THE DEGREE OF CONJUGATE CONTRACTION AT THE BRIM, WHICH MAY BE SUPPOSED TO INDICATE RESPECTIVELY THE OPERATIONS OF THE LONG FORCEPS, TURNING, EMBRYOTOMY, AND THE CÆSARIAN SECTION.

HYSTEROTOMY, Laparo-Hysterotomy, or, as it is more familiarly known, the Cæsarian Section, is an operation whereby the fœtus is extracted through an opening which is made in the abdominal and uterine walls. The propriety of such a procedure, in the case of the sudden death of the mother, is, in the hope of extracting a living child, so obviously a course to which no exception can be taken, that nothing need be urged in justification of the operation in the abstract.

From the earliest period in the history of midwifery, it had been occasionally practiced on women dying during labor; and the names of Scipio Africanus, Manilius, Andrea Doria, and others, are recorded as having been brought into the world under such circumstances, in obedience to the law of Numa, which forbade the burial of a pregnant woman in whom the operation had not been performed. About the end of the sixteenth or the beginning of the seventeenth century, it would appear that the operation had been performed in cases in which the child had escaped into the cavity of the peritoneum; but as this proceeding is not, properly speaking, the Cæsarian Section, these cases are only to be regarded as instances of Laparotomy or Gastrotomy. It is not precisely known at what epoch Hysterotomy was first performed on the living woman; for there is every reason to believe that the cases published by Rousset in 1581 were to be referred chiefly to the preceding category. This work, celebrated in the history of the subject, gave rise to the most extravagant expectations, and at one time the operation was so recklessly performed by surgeons, that it was only by the uncompromising attitude of Guillemeau and Ambroise Paré that it fell into disfavor. It is of this period that Scipio Merunia spoke when he talked, with pardonable exaggeration, of the operation being as common in France as bleeding in Italy. The opposition thus encountered in such influential quarters had wellnigh condemned the Cæsarian operation to oblivion; but it was again revived, and gave rise to endless and bitter discussion during the whole of the seventeenth, and, we may add, the first half of the last century, without anything definite having been elicited or determined upon, the profession being divided into two parties, one of which condemned the operation in the most uncompromising way, while the other as warmly, and with even less of discretion, was enthusiastic in its support. It will be observed, therefore, that the Cæsarian Section, as now calmly looked upon in the light of science, dates from quite modern times.

While it must be admitted that every step in advance which has been established by conservative midwifery throws further into the shade the sacrificial or more desperate operative resources of the art, there probably exist no practitioners in the present day who will not admit that there are cases in which hysterotomy is justifiable on grounds which will stand the test of the strictest scientific examination. Putting aside, for the moment, the cases in which it may be practiced upon the dead, it may be broadly asserted that the operation is called for on the living in all cases in which the state of parts is such as to preclude the possibility of delivery by embryotomy. In other words, we are driven to this last resource wherever we recognize the fact, that the fœtus, however mutilated, cannot be extracted by the pelvic canal.

Considerable difference of opinion unfortunately exists as to the limit of contraction which will warrant the performance of Hysterotomy. In Germany, it is very generally asserted that two and a half inches, in the conjugate of the brim, is to be held as the limit in question; but there are, in so far as we are aware, none in this country who indorse this view. What has already been said in the preceding chapter affords ample proof that craniotomy may be successfully performed in contractions of one inch and three-quarters; and the experience of some of the most distinguished of modern operators seems to show that this limit may be reduced to one inch and a half. We may say, then, confidently, that when the conjugate diameter exceeds these limits, we are in no case justified in at once deciding in favor of the Cæsarian operation. We must once more, however, reiterate a former observation, and call attention to the fact that the conjugate measurement is not alone to be taken into account—as it is too much the fashion to do—seeing that we may have irregular or angular distortion, in which the other diameters are similarly or, it may be, chiefly distorted. And it is a point of very great interest and importance that, of the whole number of reported cases of hysterotomy, a large majority was due to osteomalacia, in which, as we have seen, the typical distortion does not involve the conjugate diameter at all. A much smaller number were cases of rickets; and, among the rarer conditions calling for the operation, may be mentioned exostosis, fracture of the pelvis, spondylolisthesis, fibrous or other tumors, and carcinoma of the os and cervix. What we wish, therefore, more particularly to notice is that the conjugate measurement cannot be accepted as *the* test of the necessity which may be assumed to exist for the performance of this operation.

The maternal mortality in this country has been so great—not less than 85 per cent. of all recorded cases—that a very general idea prevails that this is almost exclusively a child's operation. This is a double error; for, when we perform the operation, in a case where we know that the child cannot be otherwise born, we give the mother the chance, small though it be, of recovering from the effects of the operation, while otherwise we must leave her to die; and, as regards the child, the results are far from being so favorable as to warrant us in looking upon it as a child's operation, although it may, no doubt, fairly be inferred that this is attributable in some degree to the fact that the operation was delayed too long.

If we turn for a moment from British to Continental statistics, it must be admitted that the results are vastly more favorable in the latter case. The reason of this is obvious, and has its origin directly or indirectly in the greater regard for fœtal life, which, on religious grounds, causes hysterotomy to be looked upon with more favor than embryotomy. Dubois says, for example, that when the brim is contracted to two inches, and the child is living, we should choose the former operation without hesitation. His authority, therefore, and that of others of equal distinction, has necessarily led to the performance of hysterotomy in a larger proportion of cases than has ever obtained in this country. Moreover, the very anxiety to save the child leads to the performance of the operation at a much earlier period of labor than is practiced in this country; and we cannot doubt that it is this which brings about their successful results. It is, indeed, of vital importance that the operation should not be delayed until symptoms of exhaustion have set in, as has been too often the case in England,—although we operate, primarily at least, in the interests of the mother, and with a mere secondary consideration for the life of the child. It is difficult to avoid the conclusion—in which we have the support of Cazeaux—that the operation is rashly undertaken, by many of our Continental brethren, in cases where the proper operation is embryotomy. This is one of many causes which should encourage us to give to the subject of embryotomy our best and most earnest consideration, that we may, by perfecting that operation, reduce more and more the necessity for having recourse to hysterotomy. If we admit the religious element into the question, or other considerations, such as that suggested by Denman—that we should gravely consider, whether, in the case of a woman who, knowing that she cannot bear a living child, has allowed herself to become pregnant, we should not act rather in the interests of the child; or, in other words, if we weigh the life of the child as of equal importance in any case with that of the mother, we will speedily become bewildered in the mazes of casuistry, and may be led to do what is morally wrong. In a word, hysterotomy is no exception to the general rule, that we should act *primarily* in the interests of the mother.

When the operation is called for by the death of the mother, either before or during labor, there are no considerations which will encourage a moment's hesitation or delay. If during labor, it may be possible to turn and deliver, or to extract by the forceps almost as rapidly as to remove the child through the abdominal walls,—and this proceeding has the advantage of being less repugnant to the feelings of relatives and friends; but, if the os is not sufficiently dilated, or if labor has not commenced, we have no choice in the matter, the only rule being to extract the child without unnecessary delay. The period during which the vitality of the child may be preserved is probably very limited. Authentic cases are recorded in which the child has been removed alive ten, fifteen, and even thirty minutes after the death of the mother; but we must treat as fables those instances of which we read, where it is said to have been found alive, ten, fifteen, or twenty-four hours after the mother had ceased to live. In death before the seventh month, it would be a manifest impropriety to operate; but religious convictions have caused this to be done in order that the child may have the benefit of Christian baptism.

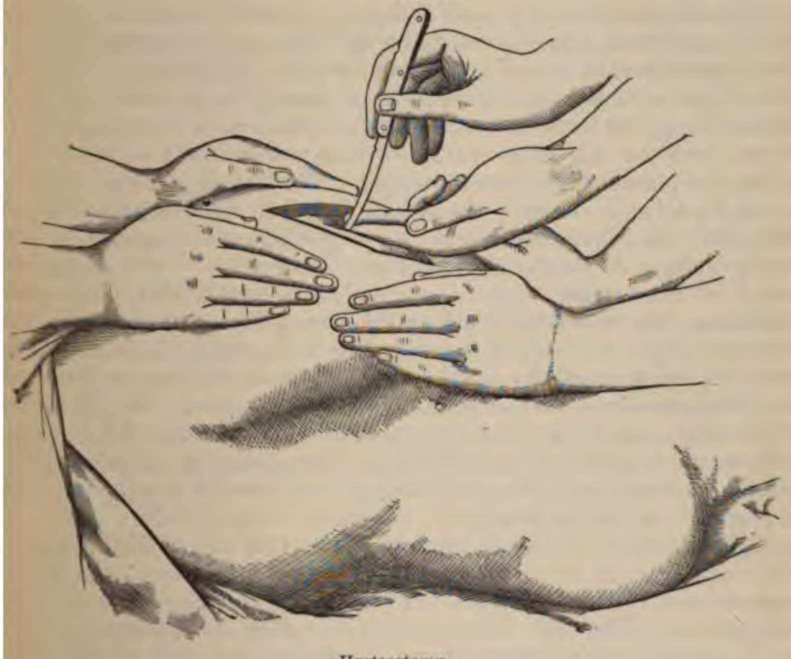
The Cæsarian operation is, however, under certain circumstances, imperatively demanded while the mother still lives. Let us see, therefore what are the conditions upon which success will mainly depend. The first, and perhaps the most important point, is the early recognition of the nature and extent of the obstruction. This will enable us to prepare the woman, in some degree, for the great peril to which she is about to be subjected, by careful attention to the bowels, and so forth. It is a matter of doubt, whether we should wait for the coming on of labor, or induce it artificially. There are arguments in favor of both modes of procedure, but perhaps the safest plan will be to wait until nature gives evidence that she is about to call upon the uterus to assume its physiological action, which will be an assistance to the operator at certain stages; and, besides, we are entitled to assume that, at the full time, the healing process is more likely to be encouraged by the normal physiological phenomena of involution. Under no circumstances should we operate until the os has opened to some extent, so as to permit of the discharges passing by the normal channel; but, if it be thought advisable to precipitate matters, this can always be done by some of the ordinary modes of procedure for bringing on premature labor. Winckel says that the most favorable period for the operation is the end of the first stage, and he recommends that we should not rupture the membranes, as some have done, with the view of permitting the escape of the liquor amnii.

The Operation.—The measures to be taken before commencing the operation should be those which the most experienced of our ovariotomists have found, of late years, to be conducive to success. The patient should be placed upon a high bed or table, in a good light, with her shoulders a little elevated. The temperature of the room should, if necessary, be artificially raised. There should be at hand an abundant supply of hot and cold water, and a weak solution of carbolic acid, with a sufficiency of towels and sponges. Several bistouries, with sharp and blunt points, artery forceps, ligatures of various kinds (including antiseptic catgut), bandages, carbolized dressings, and a long probang, will, with the usual minor instruments of an ordinary pocket-case, be all that is necessary. The propriety of giving chloroform in this operation has been called in question, chiefly on account of the disastrous effect which an attack of retching might have at a critical moment of the procedure; but, if the stomach is empty before this agent is administered, the risk is not likely to be great. The operator, standing in front of the patient, and having ascertained that the bladder is empty, must first examine the abdominal walls, in order to ascertain, with precision, the position of the uterus with reference to them. A final examination, *per vaginam*, should also be made, as a considerable number of cases of osteomalacia have been recorded in which the bones of an extremely distorted pelvis have yielded so much as to admit of the passage of the hand. The primary incision is to be made in the middle line, and should extend from a little below the umbilicus to about two and a half inches above the pubic symphysis. Further than this it would be imprudent to go in the latter direction, and, in the case of extreme deformity or unusual shortness of stature rendering a larger incision necessary than can be effected by this rule, the wound should be commenced above, and a little to the left of the umbilicus. The knife should be carried through the skin and subcutaneous cellular tissue, and the various aponeurotic layers successively divided, until the peritoneum is reached. Any bleeding vessels should be carefully secured before going further.

The uterus having been previously adjusted, so as to bring its axis as nearly as may be into parallelism with the abdominal incision, the hands of two assistants are now to be placed above and below, with the view of bringing the uterine and abdominal walls into close apposition, and thus maintaining their relative positions until the operation has been completed. The section of the peritoneum should be effected with caution, not only with the view of protecting the subjacent uterine tissue, but also to avert the possibility of wounding the bowel, as cases have been known in which convolutions of the small intestines were lodged in front of the uterus. When the peritoneal cavity has been opened in this manner, the operator should introduce, through the first minute incision, a director, upon which he may cut; or, having made an aperture sufficient to admit of the passage of the forefinger, that may be advantageously used as a director, along the palmar surface of which a blunt-pointed bistoury may be passed. During the whole of this process, the attention of the assistants should be sustained, so as to prevent the possibility of protrusion of the bowels, while any discharge should be assiduously removed by means of sponges wrung out of carbolic solution.

The surface of the uterus being now brought into view, the next stage of the operation consists in the section of its walls. It has been said that the site of the placenta may be determined by auscultation, a bulging of that portion of the uterine wall, and by certain other signs to which it is unnecessary to refer; but we do not believe that any of these signs are such as may be depended upon, so that the exact situation of the placenta must remain, in some degree at least, doubtful. The uterine incision is to be made in the middle line, so as to correspond to that in the abdominal walls, and is to be carried cautiously through the peritoneum and proper tissue of the organ, so as to avoid the fundus and cervix; the reason being that the section of the circular fibres there situated would be extremely likely to cause a gaping of the wound. As the knife approaches the inner surface of the uterus, we must exercise some caution lest we injure the placenta, which may be immediately subjacent; and if it should chance that this structure intervenes between us and the embryo, we must carefully make our way to the edge of the placenta before attempting to extract the child.

FIG. 174.



Hysterotomy.

If—as is usually considered a favorable condition at this stage—the membranes are intact, the escape of the liquor amnii must be guarded against at the moment of perforation. For this purpose, the aperture in the membranes should be made as minute as possible, and an assistant specially detailed for this duty should carefully receive in sponges the fluid as it escapes, so as to prevent its entrance into the cavity of the peritoneum. An orifice of sufficient size being thereupon made, the extraction of the child should be effected with the least possible delay, the feet being seized, and delivery promptly completed. While this is being done, a certain amount of uterine contraction will usually occur, which is an additional reason for speedy action on our part; otherwise, the breach in the uterine walls will become rapidly diminished in size. It has not unfrequently happened that, when the body of the child has been successfully extracted, the contraction has been so rapid as to cause the neck to be so firmly grasped as to prevent the completion of the operation, a state of matters in which it is better to enlarge the incision, than to use force, by which we can only succeed by tearing open the wound.

If the placenta is not at once detached, the hand should be immediately introduced into the cavity, and the organ separated from its attachments, and extracted as the hand is being withdrawn. The chief risk of the operation at this stage is, of course, the hemorrhage which necessarily occurs from the uterine sinuses which have been cut through, as well as from the inner surface of that portion of the organ from which the placenta has been separated. The former is the source from which bleeding is chiefly to be looked for; but experience has shown that this risk is very much less than might have been anticipated, the actual amount of discharge depending, in a great measure, on the efficiency of the uterine contractions; and, it is certain that, fatal as the operation is in its results, death rarely ensues from hemorrhage. The greatest care on the part of the assistants is necessary, in order to prevent the entrance of the blood and other discharges into the cavity of the peritoneum, and the escape from it of the intestines. Perfect success in this direction is, of course, impracticable; but, we may be sure that the less the quantity of such discharges that comes in contact with the peritoneal membrane, the less likely is the dreaded peritonitis to be severe or fatal in its character. The use of the carbolic solution, by sponges and otherwise, will further reduce this risk. The escape of the intestines may be prevented, and the approximation of the uterine and abdominal walls efficiently maintained, by an expedient which was suggested by Winckel. This consists in having the extremities of the uterine wound hooked upwards by the finger, and thus brought into contact with the walls of the abdomen, a manœuvre which is peculiarly applicable to cases in which the number of assistants is deficient. The probang should finally be passed downwards through the os uteri to the vagina, which insures for the discharges free egress by the normal channel.

Delivery having been by these means effected, the mode of closure and general management of the incisions, uterine and abdominal, is the subject which next engages our attention. When the uterus has well contracted,—a process which is materially hastened by pressure of the organ, and even by the application of cold,—when all bleeding has ceased, and when the discharges have been wiped away as thoroughly as possible, the edges of the wounds are to be brought into apposition. It is a matter of dispute whether we should or should not stitch the uterine wound. It is quite certain that this is not essential to success, and it is doubtful, as may be inferred from the experience of Winckel, whether or not it is in any way beneficial. Still, on ordinary surgical principles, and recognizing the fact that, in a certain number of fatal cases, the wound has been found gaping after death, we cannot wonder that most operators seek in this way to promote union of the uterine tissues. But for one circumstance, the most advantageous procedure would be to bring the uterine and abdominal wounds into close apposition by the same suture; but the circumstance in question is a most important one, and depends upon the contractility and natural involution of the uterine tissue, which would necessarily involve forcible dragging upon the wound. To effect closure of the uterine incision by means of suture, while the risk referred to is at the same time avoided, has been, therefore, the great object of many of those who have had occasion to perform the operation. Mr. Spencer Wells, for example, in a case in which he performed it with a successful result, passed an uninterrupted silk suture, the end of which he brought through the vagina, and subsequently removed; while Dr. Barnes suggests an ingenious but more complicated method, by which the uterus is stitched and united to the margin of the abdominal wound, while provision is, at the same time, made for the contraction above referred to.

Whether or not the uterine wound is closed, that in the abdominal walls is, of course, to be brought into accurate apposition. The material to which a preference is usually given is fine silver wire, of which five or six stitches are to be passed through the cutaneous and peritoneal margins of the incision; and after these have been carefully adjusted, they are to be drawn tight and fastened in the usual way, additional superficial sutures being, if necessary, added, so as to bring the whole length of the superficial incision into accurate apposition. The carbolized catgut ligature suggested by Professor Lister may, with possible advantage, be substituted for the silver wire. Prepared gauze, or other antiseptic dressings, may now be applied, which are to be retained in their position by strips of sticking-plaster and a carefully adjusted bandage.

A full opiate should now be administered either by enema or suppository, and perfect quiet and rest enjoined, the dressings being undisturbed for five or six days. The sutures are to be removed about the eighth day. The vagina may be washed out by injection of tepid water with a little Condy's fluid, and the bladder emptied by means of the catheter twice a day; and, on the fourth or fifth day, the bowels may be relieved by a simple enema. The diet throughout should be of the lightest possible character, and every conceivable disturbing element, bodily or mental, should be scrupulously avoided.

Reference has already been made to the operation of ovariotomy. It must not, however, be supposed that we have any idea of tracing the analogy which exists between the two operations. Hysterotomy, indeed, involves conditions which are manifestly far less favorable than those which attend on an ordinary case of ovariotomy, and we need not wonder that the results are less successful. We cannot, however, avoid the reflection, that not many years ago the latter operation was looked upon as scarcely more promising in its results than that which we are now considering; and, when we reflect further upon the wonderful improvement which modern surgical skill has effected in the one operation, we are surely justified in expressing a hope that the experience thus gained may be so made available as materially to reduce, in the future, the fearful mortality which, in the past, has attended the Cæsarian Section. Upon nothing will the result be more likely to depend than upon the period at which the operation is performed. If, as has too generally been the case in this country, it is adopted only as a last resource, when the vital powers are exhausted by lingering labor, the expedient is, indeed, a desperate one. But if, on the contrary, the necessity is recognized at a period sufficiently early to enable us to select the time and the conditions which are most favorable, our prognosis will admit of something more of hope.

The shock of the operation is often very great, and may prove fatal at once, before the secondary effects of peritoneal inflammation have manifested themselves. Hemorrhage is, as we have said, and as the experience of Winckel has shown, by no means a prominent cause of the fatal result; but it is otherwise with peritonitis, which may be looked upon as almost inevitable when the woman survives the immediate effects of the operation. This may come on within twenty-four hours, and is indicated by the occurrence of rigor, severe abdominal pain, with more or less tenderness on pressure, labored respiration, flatulent distension of the bowels, and a rapid, wiry pulse. These alarming symptoms may be combated by fomentations or poultices to the abdomen, mild salines, and opium; but, unfortunately, in the great majority of cases, the symptoms will go on unchecked until, under their influence, the patient succumbs. Metz, of Aix-la-Chapelle, insists upon the importance of the sustained use of cold in averting peritoneal inflammation. The rash employment of this agent would, undoubtedly, as every one knows, rather tend, by reaction, to produce inflammation than to repress it; but of this Metz was quite aware. He recommends that, so soon as the woman has been put to bed after the operation, compresses of cold water should be placed over the abdomen, and that after a few hours, ice in a bladder should be substituted, while cold injections are thrown into the rectum, and the patient is encouraged to swallow, from time to time, morsels of ice. Under such treatment, he says, the patient is sensible of a feeling of comfort to which she was previously a stranger, and this sensation may be fully trusted to as a safe guide to the length of time and the extent to which this mode of treatment may be safely carried. So long, then, as the woman remains comfortable, cold may be employed; but the moment she complains of chill or discomfort, the cold is at once to be modified or withdrawn. Cazeaux seems to give a general support to this mode of treatment, which has also been practiced by Kilian. Dr. Metz asserts, that of thirteen cases treated on this principle one only died,—a statement so glaringly absurd, that we can only suppose this is one of the many pernicious instances of the reckless use of statistics with which, unfortunately, the literature of obstetrics is disfigured, and which sometimes makes us inclined to pass by with contempt suggestions which may, nevertheless, have in them the germ of truth and practical worth.

It sometimes happens, as a result of the healing process, that the uterine and abdominal wounds become agglutinated, so as to produce permanent adhesion at this place, without, as would appear, entailing any serious inconvenience. This fact is made use of by those who advocate the stitching together of the two wounds, and there has been proved to exist, in some of those cases in which the Cæsarian section has been repeatedly performed, an extent of adhesion which has admitted of the performance of the operation without opening the peritoneal cavity; and it is obviously to this fact that the exceptional success attendant on such operations is to be attributed.

Gastrotomy, or *Laparotomy*, is an operation which has already been alluded to as applicable to cases in which the child has escaped into the abdominal cavity, either from a ruptured uterus, or in cases of extra-uterine pregnancy. Some of the older cases which have been recorded as Cæsarian section have clearly been of this nature,—the operation being, as is obvious, only one stage of the more formidable procedure which we have been considering. There may possibly be cases, moreover, as has already been shown, in which, although the cyst of an extra-uterine conception has not been ruptured, it is necessary to perform this operation when the life of the mother is threatened by pressure on important organs, and also under some other circumstances of a like nature.

The operation is simply the first stage of the Cæsarian section, and is to be conducted with precisely the same precautions; but an aperture must be left at the lower part of the external wound to permit of the escape of the discharges. It might naturally be inferred that an operation which does not involve the uterine walls, would be attended with much more favorable results. In practice, however, we shall probably, when we take the whole circumstances into consideration, look upon the one with as great apprehension as the other. The operation of Gastrotomy has, in fact, certain special dangers in the practice of midwifery, and is very different, in all respects, from the ordinary operation for the removal of an ovarian cyst. The conditions which attend rupture of the uterus, or of an extra-uterine cyst, have already been detailed, when those accidents were under consideration. In each case, the ovum, its appendages, and the liquor in which it floats, all escape into the peritoneal cavity, along with a large quantity of fluid and clotted blood,—a portion of which must necessarily be left behind,—so that the chances of peritonitis are probably not less in the one case than in the other. And, in the case of extra-uterine pregnancy, the peculiar anatomical conditions which are often involved in the nature of the placental attachment, are of such a nature as to render these cases desperate in their character. In fact, whatever statistics may seem to prove, and Kilian and a few others may have said, we must always look upon this operation as one of the last resources of our art.

When the child is extracted by means of incision, practiced from the vagina, the operation has by some been termed Vaginal Cæsarian Section, a phrase which is obviously improper. The circumstances which may render necessary such an operation as this, are malignant disease of the os and cervix which renders dilatation impossible, congenital occlusion of the os, or retroversion of a gravid uterus. Similar operations, not involving the tissues of the uterus, are rendered necessary in some rare instances of extra-uterine pregnancy, in which the fœtus may be reached in this way; but in all these cases the operation is simple, and requires no special directions other than to use bistouries and other instruments so guarded as to incur no risk of wounding the surrounding tissues; and, at the same time, to cut with care, so as to avoid inflicting any injury upon the child.

Symphysiotomy.—In 1768, Sigault, a young student of medicine, at Paris, submitted to the Académie de Chirurgie, a proposition that women might be delivered without very great risk, by means of an operation which he thus named. The proposal was received with ridicule, and the essayist was treated as a madman. Nothing daunted, however, by this rebuff, the young Sigault stoutly maintained his position for several years, but it was not until 1777 that he performed his first operation in the presence, and with the assistance of the celebrated Leroy, who, having espoused his cause, ultimately became a warm advocate of the new procedure. Both mother and child were saved in this case, and Sigault soon found himself famous and overwhelmed with benefits, as the discoverer of a method which was to replace the hated Cæsarian section, and, consequently, as a benefactor of his race. The Académie de Médecine, as if to atone for the indignity which the sister society had put upon him, received him with open arms, and actually struck a medal in honor of the event. In France and Germany, the profession was much divided on the subject, but in England it somehow never gained a footing, nor would we even now have given any attention to the matter, were it not that in all modern Continental works on obstetrics, some degree of prominence is still given to the operation, as one which might, under certain circumstances, be advantageously performed.

The division of the pubic symphysis is, from a surgical point of view, a matter so simple, that it is unnecessary to particularize the details. It is proper, however, that in expressing as we now do the opinion that the operation is one which must be unhesitatingly and absolutely rejected as irrational, some reason should be adduced for a view which is so confidently expressed. To begin, then, symphysiotomy is to be rejected as a mere chimerical idea, which had its origin in views as to the movement of the pelvic bones during labor, than which nothing, theoretically or practically, could be more incorrect. It was shown, in an early chapter of this work, that the very trifling movement which nature permits during labor in the human pelvis is one in which the symphysis pubis is the hinge. At the time when Sigault wrote, the idea usually entertained was exactly the opposite, viz., that the hinge was at the sacro-iliac synchondrosis, and that the pelvis gaped at the symphysis; and it could only, of course, have been with the object of encouraging such a movement as this, that the operation could on rational grounds be supported. Again, such an obstruction as might seem to call either for Craniotomy, the Cæsarian section, or this new operation, would, in a considerable majority of all cases, consist mainly in contraction of the conjugate diameter of the brim; but a moment's reflection will serve to show that this operation is not one which is likely to reduce the diameter which is thus encroached upon, for, while it certainly will increase the circumferential measurement of the pelvis, and the transverse and oblique diameters, it leaves the conjugate comparatively untouched. And, if we turn to the results of the operation, we will at once find that the boasted advantage has no existence, save in the imagination of the inventor. Baudelocque says, that, in forty-one cases of the operation, fourteen women died, while only thirteen children were born alive. The narrative of recorded cases shows that, while the forces of nature *may* prevail after the operation, it will often be found necessary to apply the forceps, or turn, after the original operation has been completed. As regards ultimate results, Cazeaux says, "In the most fortunate cases, the consolidation of the symphysis is only complete after a lapse of three or four months. Women have been seen in whom it had never taken place, and who, nevertheless, have eventually been able to walk. There then forms, according to Alphonse Leroy, a fibro-cellular tissue, which, filling up the gap in the symphysis, maintains the solidity of the articulation."

Various modifications of the operation have been suggested, including one method, which has received the support of Stoltz of Strasbourg, and which he termed *Pubiotomy*. In this case the operation is performed by a chain saw, which is introduced subcutaneously. A small opening is first made to the right or left of the middle line over the pelvic crest, and through this a strong needle, slightly curved, is introduced. This is passed behind the pubis, and brought out by the side of the clitoris, and by it the chain saw, to which it has previously been attached, is pulled through, and made to act upon the body of the pubis from within outwards, until the bone has been divided. The operation of symphysiotomy has been but once practiced, in so far as we are aware, in this country; and on the Continent, in the present day, it is so seldom employed that the question may now be looked upon as forming little more than an episode in the history of the operative midwifery of the past.

It may be interesting at this place, by way of recapitulation—but without any pretence of or attempt at anything more than an approximation at accuracy—to set down, in a tabular form, the various conjugate measurements at the brim which, according to the best authorities, may be supposed to indicate the necessity for the several operations which we have now been considering. Burns, speaking of one of the operations referred to, says—and the observation will apply with equal force to any of them: "There is only one degree of disproportion, then, betwixt the head and the pelvis which will admit of this; but the smallest deviation from it destroys the advantage of the operation. Now, as this disproportion is so nice, we cannot in practice ascertain it; for, although we could determine, within a hundredth part of an inch, the capacity of the pelvis, yet we cannot determine the precise dimensions of the head, and thus establish the relation of the two." The student, we would again repeat,—at the risk of being accused of unnecessary iteration,—must, above all things, beware of assuming that conjugate contraction is his only guide, or one which is uniformly to be relied upon. The following figures, therefore, have reference only to cases of conjugate contraction, in which the other diameters are either unaltered, or are, at least, not very greatly diminished. With reference more particularly, to the Cæsarian section, in which osteomalacia is the most frequent cause of deformity, it should be remembered that, in that type of pelvis, the conjugate measurement, so far from being a criterion of the deformity, is more likely to lead the observer to conclusions which are quite erroneous.

With this explanation, then, the following may be given, as showing, according to the most approved authorities, the degree of conjugate contraction at the brim, which may be supposed, under ordinary circumstances, to indicate the various operations which have been described:

Long Forceps, ...	4 to 3¼ inches.
Turning, ...	3½ to 2¾ "
Craniotomy, ...	3 to 1½ "
Cæsarian Section, ...	1½, and under.

CHAPTER XXXIV.

INDUCTION OF PREMATURE LABOR.

HISTORY OF THE SUBJECT—NATURE AND SCOPE OF THE OPERATION—VIABILITY, OR NON-VIABILITY OF THE CHILD—CONDITIONS WHICH JUSTIFY THE OPERATION—VARIOUS METHODS OF PROVOKING UTERINE ACTION: ERGOT: PUNCTURING THE MEMBRANES: SEPARATION OF THE MEMBRANES BY HAMILTON'S METHOD: DILATATION OF THE CERVIX BY TENTS: INTRODUCTION OF AN ELASTIC BOUGIE OR CATHETER INTO THE UTERUS: PLUGGING OR DISTENDING THE VAGINA: THE METHOD OF KIWISCH BY THE VAGINAL DOUCHE: COHEN'S METHOD BY INTRA-UTERINE INJECTIONS: DR. BARNES'S PROCESS, CONSISTING OF A "PROVOCATIVE" AND AN "ACCELERATIVE" STAGE: GALVANISM: IRRITATION OF THE BREASTS—ANATOMICAL AND PHYSIOLOGICAL FITNESS OF THE PARTS—CONSTITUTIONAL INFLUENCES.

It is with something of a sense of relief that we turn from a consideration of the destructive operations of midwifery, to what is perhaps, in the strictest and truest sense, the most conservative of all the resources of our art. There is a fitness, moreover, in considering the subject at this place, as it affords, within certain limits, a means by which the necessity for the more serious operations may be avoided.

Of all methods of operative procedure which are applicable to the practice of obstetrics, there is none which has given rise to such prolonged and often acrimonious discussion. Putting aside various expedients which were occasionally adopted both in ancient and modern times to expedite delivery, there can be no doubt that the induction of premature labor is an operation which we owe to the sound judgment of the English school of midwifery, by the sheer force of which, and the vigorous support it received from many influential quarters, the operation was soon forced into notice. In 1556, a conference was held in London, which was attended by the most eminent practitioners of the day, at which this question was fully and exhaustively considered in all its bearings, with the result of formally admitting it as a recognized practice of the English school.

For reasons which have already been more than once adverted to, the induction of premature labor was not likely to obtain a ready assent on the Continent, where, on the contrary, it found opponents who were so virulent in their hostility that an operation, which is perhaps above all others morally right, as well as beneficent in its action, was for many long years contemptuously rejected. The great force of truth, however, ultimately prevailed, and the operation was performed in Germany by Wenzel, in 1804; but it was not till 1831 that Stoltz, of Strasbourg, led the way by performing the first operation in France—not the least of the benefits which this distinguished obstetrician conferred upon that branch of science with which his name is still honorably connected. From this moment the success of the operation was assured, even in the country where it had been longest resisted. Sentimental scruples in regard to fœtal life, which had swayed the opinion of many, were shown to be in this case quite irrational, and could be supported by no argument, moral or religious, the sophistry of which could not easily be expressed. And as time wore on all doubt vanished, and it may now be said that in the present day the practice of the Continent is as advanced as it is in England, and perhaps of late years has attracted even more attention than with us. The only remnant of the original prejudices, which still exists in the minds of some, is the opinion, occasionally entertained, that we should not perform the operation repeatedly upon the same woman, on the principle which has induced these persons to bring the interests of the child into greater prominence in the case of a woman who has once been delivered by craniotomy, and who ought, therefore, according to them, to be exposed to the fearful danger of the Cæsarian section, in order that the infant may be born alive.

The Induction of Premature Labor, in its widest sense, is an operation varying greatly in its details, whereby the uterus is artificially stimulated to expel its contents at any period prior to the completion of the full term of utero-gestation. The merest glance at the subject will therefore suffice to show that the operator must feel the sense of responsibility more the earlier the period of pregnancy at which the presumed necessity for the operation may arise. At the sixth, and at the ninth month, the operation will differ in no essential particular, and may be attended with equally trifling risk to the mother. But in the one case we sacrifice a child, by bringing it into the world before it is viable; while in the other we merely induce the premature expulsion of an infant which there is every reason to suppose may survive; so that we must carefully draw a distinction between the induction of *abortion* and of premature labor in its more restricted sense. The general opinion, which has found expression in the "Code Napoléon," is, that the end of the sixth month is the period at which the fœtus may be considered viable; but the experience of all accoucheurs extends this till towards the end of the seventh month—before which time, indeed, we have but little hope that the child may be reared. It is clear, therefore, that if the cause calling for the induction of premature labor is of such a nature as to warrant us in deferring the operation until the end of the seventh month has been reached, we should do so, avoiding, at the same time, the risk of overcaution, which, by delaying too long, may leave the mother exposed to the dangers from which it is our primary object to save her.

The conditions under which we may be justified in performing the operation vary considerably. When we operate before the middle of the seventh month, we may look upon our procedure as one which we undertake in the interests of the mother alone, without any reference to the child, which is thus deliberately sacrificed. While it is true that these are the cases in which a sense of responsibility is most likely to weigh upon us, there are instances, undoubtedly, in which delay incurs a responsibility more serious still, in leaving the case to nature, when the sole alternative of the Cæsarian section will almost surely result in the sacrifice of the mother, and probably also of the child. There is another class of cases—which have been alluded to in a previous chapter—in which we are sometimes, though very rarely, warranted in inducing abortion. The most familiar example of this is found in the excessive vomiting which occasionally attends pregnancy, so as to bring women previously healthy to the very verge of dissolution. We have great difficulty in admitting this as a cause justifying abortion, and most certainly no young practitioner should have recourse to the operation without very careful consideration, and, if possible, the advice and assistance of those more experienced than himself. For if disaster does occur—and we cannot doubt, from cases given by Tyler Smith and others, that it occasionally does so—from delay, we cannot but fear that a too great familiarity, under such circumstances, with an operation which is in itself a simple enough one, would result in a wanton sacrifice of fœtal life. Nature, as we have already shown, almost invariably comes to the relief of such cases, so that the circumstances which might warrant the operation must be extremely rare.

There are instances again in which, at a more advanced period of pregnancy, the operation is undertaken in the interests of the child. There are few practitioners of much experience who have not encountered cases in which women, often apparently robust, have been, on successive occasions, delivered of still-born children near the full time. In such we should not hesitate to bring on labor before the time at which the death of the fœtus was presumed to have occurred in former pregnancies, fixing the period as near the natural termination of the pregnancy as may be deemed prudent. The causes which give rise to the death of the fœtus, in these cases, are often obscure, and sometimes can by no means be distinguished; but in most instances there is, as we may assume from what has actually been demonstrated, some diseased condition, which interrupts the placental circulation, and thus causes the death of the child. Any of the diseased conditions of the placenta formerly enumerated—such, for example, as fatty degeneration—may have this effect; and it is, probably when the disease is rapidly progressive, towards the end of pregnancy that we are able, by premature delivery, to avert its otherwise inevitable effect on the life of the child by placing the latter in circumstances in which, aerial respiration having been established, it is independent of the placental circulation.

It is, as we have seen, a natural physiological accompaniment of pregnancy, towards its period of termination, that the utero-placental tissues loosen somewhat, preparatory to the occurrence of delivery; and when no actual disease of the placenta can be discovered, it has been supposed that premature separation of the decidua may, either by rupture of the vessels, or by interference with the circulation within them, directly or indirectly destroy the fœtus. In some cases,—of which we have seen two examples,—it would seem as if the uterus, as in habitual abortion independent of disease, had assumed a habit of throwing off its contents at a certain time, before the conditions otherwise favorable to live-birth were in operation; and yet when this so-called habit is once broken by the induction of premature labor at a somewhat earlier period, the woman, in subsequent pregnancies, carries her children to the full time. The operation may even be warranted in cases in which, although the children may have previously been born alive, they have, owing to the occurrence of some of the diseases referred to, been the subjects of what has been termed, with some propriety, "intra-uterine marasmus," and have not long survived their birth. In cases of still-birth, a very excellent rule which has been laid down for our guidance in subsequent pregnancies is to examine with great care the placenta and membranes.

The cases which are most frequent in their occurrence, and at the same time, most satisfactory in their results, are those in which we operate with the double object of saving both mother and child from great peril or almost certain death. Merriman has insisted, with great justice, upon the caution which we should exercise when the conditions which seem to indicate the necessity for premature delivery occur in primiparæ. To a great extent, this warning is sound and judicious, but we must avoid carrying the principle too far; for, if the circumstances are such as seem to preclude the possibility of the passage of a mature fœtus at the full term, we are equally justified, in primiparæ, as in other cases, in having recourse to an operation which thus obviates inevitable risk. In pluriparæ, much, and possibly everything, will depend upon the history of former labors. If, for example, it has been found necessary, once or oftener, to relieve the woman in previous labors by the operation of craniotomy, or even by turning or the long forceps, with an invariably fatal result, the estimate which we may be inclined to form of the probable danger is thus corroborated by experience; but, where the indications are less certain, we must be firmly convinced that the operation gives the best chance to the child as well as to the mother before we can hold ourselves as warranted in acting.

Inasmuch as the life of the infant will depend, in all cases, upon the degree of development which has been attained prior to birth, it is of the first importance that we should form a correct estimate of the period beyond which we cannot safely go. As the necessity for this proceeding, as well as for the more serious expedients of embryotomy and the Cæsarian section, arises, in a very large proportion of cases, from contraction of the conjugate diameter of the brim, we should, in the first place, endeavor to ascertain, with as much accuracy as may be attainable, the precise degree of the contraction. This may be done approximately by the methods of pelvimetry which have been already detailed. It is obvious that such an amount of contraction as would call for the Cæsarian operation, will require measures for the relief of the woman to be taken at an earlier period than when the diameters are such as to point to embryotomy. In cases of conjugate contraction, as has already been shown, the head lies pretty nearly in the transverse diameter, so that it is the biparietal measurement which corresponds to the contracted diameter of the brim.

While estimating, therefore, the degree of pelvic contraction, it is proper that we, at the same time, bear in mind the probable measurements of the biparietal diameter of the cranium at various epochs in the course of the last two or three months of pregnancy. Stoltz has ventured to give measurements which, reduced to the standard of the English inch, we may quote as probably approximating the actual condition of the parts. Between the thirty-second and the thirty-third week, the biparietal diameter is somewhere about two inches and three-quarters; from the thirty-third to the thirty-fifth, three inches; and from the thirty-sixth to the thirty-seventh, three inches and one-third. If, therefore, we have to deal with a case in which the conjugate diameter is two inches and a half, or under, we should operate not later than the end of the seventh month, even making all allowance for the greater compressibility of which the head, at this early period, is susceptible. Conclusive proof of twin pregnancy may, as Cazeaux has shown, modify our procedure in this particular, or might even warrant us in abandoning the case to nature, if the contraction is not excessive; and this for two reasons,—because twins are generally less developed, and because their organization is seldom so perfect when they are prematurely born as to enable them to maintain an independent existence.

In cases of pelvic distortion where the conjugate falls under one inch and three-quarters, the only possible alternative will, in most cases, be the Cæsarian section. A case such as this necessitates abortion, for it is only by operating in the course of the sixth month at latest, that we can expect to save our patient, by the expulsion of the fœtus before the period of viability. At whatever period the operation may be resolved upon, there is always a greater probability, which should not be lost sight of, of obstruction from malposition of the fœtus; and the more removed the case is from the natural term of gestation, the more likely is this to occur, and to constitute a practical difficulty which may not have been anticipated. It must not be supposed that pelvic contractions are the sole conditions, in addition to such as have previously been mentioned, which lead to the operation we are now considering. We have already seen that, in certain cases of hemorrhage, whether accidental or unavoidable, the only course of procedure that we can adopt is one which, by inciting the uterus to premature contraction, relieves the mother from the state of peril into which she has fallen, and at the same time may be the means of preserving the child.

But, in addition to these, which clearly point to the operation, there are many other instances which may fairly be admitted to stand in a more doubtful category. When a woman, for example, is, towards the end of pregnancy, affected by a serious disorder, which apparently places her life in immediate jeopardy, it cannot fail to be a matter of anxious consideration whether or not we are to reject the operative means which we have at our command, which will generally save the child, and may often save the mother. Here, as in all other cases, we must place the interests of the mother before those of the child. It will not be a safe rule in practice, although it may seem so in theory, that we may operate to save the child, if we are persuaded that, by so doing, we shall not augment the danger of the mother; so that we should, in such cases, operate only when we can convince ourselves that the procedure is also, in the main, one which affords the mother the best chance of her life.

Cases of this kind, under a variety of forms, occasionally occur in practice. In dropsical effusions into the great cavities, to such an extent as to interfere seriously with the functions of respiration, no profound consideration is required to show that the distension of the uterus is an element or unit in the mechanical causes which place the woman's life in peril; and it is, at least, a reasonable assumption that, by subtracting this unit from the sum-total of unfavorable conditions, we give the mother an additional chance, while we withdraw the child from the operation of causes which may materially imperil its existence. Certain cases of cardiac disease, or of aneurismal tumors, in which the pressure of the gravid uterus seems likely to precipitate a catastrophe which we may regard as ultimately inevitable, may, on similar principles, be our warrant in inducing a premature expulsion of the uterine contents; but, in the course of practice, other exigencies may offer themselves, in which, while the indications are less clear, we may yet consider ourselves justified in bringing the pregnancy to an abrupt termination.

Several years ago, we had an opportunity of seeing a case of this kind in consultation with Dr. Dobbie of Ayr. The patient was a lady aged thirty, who had been for some years the subject of chronic asthma. She was, in the eighth month of her fourth pregnancy, laboring under severe chronic bronchitis, of a cynanotic appearance, and with an extremely feeble and irregular pulse. All the ordinary means, applied with much skill and discrimination, had failed to afford any relief, and it was therefore resolved, in the apparently desperate circumstances of the case, to have recourse to the induction of premature labor. Dr. Dobbie kindly supplied me afterwards with the following details of the issue of the case: "About eight o'clock on Friday morning, I made a vaginal examination, with a view to learn the exact position of things, and in doing so, I found the tissues all so lax and moist, and the uterus reaching so low in the pelvis,—almost touching the perineum,—that, without withdrawing my hand, I commenced dilating the os, first with my forefinger, and then with the fore and middle fingers. At the end of half an hour, and without any complaint of pain on the patient's part, the os was fully the size of a crown, and I left it. Pains had slightly commenced by this time, and they went on increasing, but, throughout the labor, they were of a very moderate kind. At 10.45 P.M. labor was terminated by the birth of a living and healthy female child. We did our best to support strength by stimulating freely, but without avail. She died at 5 A.M. on Saturday."

This is a tolerably good illustration of the exceptional cases referred to. The result, as regards the mother, was only what might have been anticipated, had the symptoms detailed been observed unconnected with the pregnant state; and, if the case had been abandoned to the operation of nature, we cannot doubt that the result would have been a dead child as well as a dead mother. Furthermore, a retrospect of the case does not now modify, in any degree, the opinion which we entertained from the first, that the course resolved upon was—putting the child entirely out of consideration—that which gave the patient the benefit of the last ray of hope which remained for her. It is impossible to detail all the conditions which may be supposed to justify a similar course; but we may mention dropsy of the amnion, fibrous or other tumors, albuminuria, convulsions, and mania, as among the circumstances, which have, in the experience of able practitioners, been found to call for the operation.

The Operation.—As usually practiced, the induction of premature labor is a process in which operative aid plays an important, though a quite subordinate part. The *accouchement forcée* of the older French writers was a mode of procedure very different from this; and although the opponents of the English scheme did not scruple so to designate it in their bitter hostility, no analogy between the two can, in any sense, be admitted. Various as are the methods which have been practiced with a view to the expulsion of the fœtus, these, with scarcely an exception, consist, in so far as operative procedure is concerned, of expedients which are adopted with the view simply of *inducing* the uterus to expel its contents. These provocative measures are, as we shall see, very various; but, so soon as uterine action has once been thoroughly excited, the further progress of the case is usually left to nature. The different modes of inducing uterine contraction which are here referred to were divided by Stoltz into two classes. The first of these embraces all methods which are supposed to act primarily upon the system, with the object of producing, secondarily, the effect which we desire; the second comprehends all proceedings which may be adopted, with the view of operating directly upon the ovum or uterus, and thus stimulating, by reflex action, the latter to contract.

The operation of the means which may be referred to the first class is too uncertain, and has been proved to be so little to be depended upon, that, in modern times, they have been entirely abandoned, especially in cases in which delay is to be avoided; and there are, probably, no accoucheurs of the present day who would waste time in maintaining an expectant attitude, in the hope that baths, bleeding, emetics, or even purgatives, might possibly produce what they desire. The only agent which, acting through the medium of the constitution, has still some supporters, is the ergot of rye. That this drug acts, in a large number of instances, through the spinal cord, so as to influence the fibres of the uterus, is a fact which no one can gainsay; but, in cases of abortion, and in all cases in which the uterus is in a state of quiescence, its action is more variable, and less to be depended upon, than when it is employed during labor. Still, it must, undoubtedly, be conceded, that premature labor has by this means frequently been induced, and although we are inclined to reject it as a means of causing primary contraction, there seems no good reason why we may not use it in many cases, as we would in labor at the full time,—to expedite delivery, or to sustain flagging uterine effort.

The other plan,—that of operating upon the ovum or uterus, so as directly to excite the contraction of the latter, has entirely superseded such of the more remote and indirect modes of procedure as have by some been practiced. We purpose to direct attention here to the more important only of the numerous methods which have been devised directly to effect contraction.

1. The original mode of procedure, which received the support of the London Congress, above alluded to, consists in the Rupture of the Membranes, by means of a quill sharpened at the point or in any other way which may be considered more safe, in order to permit of the escape of the liquor amnii, and the partial collapse of the uterus. This is a very certain and effectual method of inducing premature labor, but it was soon found to be open to serious objections. In the first place, it compromises very decidedly the chances of the child, by allowing the uterine walls to come in contact with, and injuriously press upon it, in its imperfectly developed condition, from the beginning to the end of labor. And, secondly, it is far from being free from danger, especially in cases of abortion, when, owing to the imperfect dilatation of the cervix, the membranes are difficult to reach; and many cases have occurred of serious and even fatal results, from injuries inflicted upon the cervical tissues in the course of those efforts, as has often been the case in recorded examples of criminal abortion. On these grounds, with the exception of certain cases of hemorrhage, in which, for special reasons, it is preferred to other methods, its use is to be condemned.

2. Separation of the Membranes, by means of the finger or sound introduced through the os uteri, was recommended and practiced by Professor Hamilton of Edinburgh; but it may fairly be assumed, that the result in such cases is due as much to the irritation and forcible dilatation of the os and cervix, as to the partial separation of the membranes, which is effected by sweeping the finger or sound round the uterus, so as to cause their detachment. Still, as the integrity of the membranes is in this way preserved, although, in many cases, it must necessarily be imperilled, this may be looked upon as an improvement upon the original process.

3. The Dilatation of the Os by tents has also been practiced with considerable success, but in this case something more is attempted than mere excitement to contraction, in the forcible dilatation of the parts, by which the natural process is in some degree aided. This latter indication is, however, more thoroughly carried out in the method which

is now practiced by Dr. Barnes, as will afterwards be more particularly explained.

4. The process which, in the opinion of most operators of the present day, is to be preferred, as combining, in the highest degree, the qualities of safety and efficiency, is the introduction within the uterus and outside of the membranes, of an Elastic Catheter, which is passed without a stylet, for six or seven inches, and is allowed to remain in position. The presence of this is resented by the uterus, and, sooner or later, the organ is stimulated to contraction as by any other foreign body. The risk of injuring or separating the placenta, which some have urged as an objection to this process, may practically be dismissed. With a stylet, that might possibly occur; but, when the catheter is introduced properly, the resistance of the placental adhesion would, if encountered, be sufficient to turn aside the flexible stem.

5. The introduction of Foreign Bodies into the Vagina has been trusted to by some as a means of inducing premature labor. It has already been remarked, in discussing the treatment of the hemorrhage of abortion, that the great objection to the use of the plug was the danger, amounting almost to certainty, that the uterus would thereby be excited to expel its contents. As our object in the one case is to induce, what in the other we seek to avert, it may fairly be admitted that distension of the vagina, by Braun's Colpeurynter, Gariel's air pessary, or any other form of plug, will probably prove as efficient as it certainly is a safe method of provoking the uterus to contract.

6. The use of Vaginal or Uterine Injections was first suggested by Continental practitioners; and, as both of these methods have received no inconsiderable amount of support in this country, it is proper that we should give to them some particular consideration. The method of Vaginal injection, which is known on the Continent as that of Kiwisch, has, in this country, received the support of Tyler Smith, Churchill, and other eminent accoucheurs. The process, as originally suggested, consists in directing a continuous stream of warm water upon the os uteri by means of a long tube, which is connected with a vessel placed several feet above the level of the patient. Some operators, trusting to the effect of the warmth of the injection, allow free egress of the fluid from the vagina, while others use measures to prevent its escape, with the view of effecting anatomical detachment of the membranes from the uterine wall; and Tyler Smith expresses a preference for the alternate use of hot and cold water, as more certain to excite uterine action. The injection is to be repeated once or twice a day, for ten minutes or a quarter of an hour, when it seldom fails to bring on contraction after eight or ten applications, and sometimes after two or three. Dr. Simpson substituted an ordinary Higginson's syringe, and various modifications of the original apparatus have, from time to time, been suggested. Simple and safe as this method may appear, later experience has shown that it is by no means free from risk, and fatal cases have been reported in which death had occurred; so that, if it should be employed, caution must in every case be exercised; and we apprehend that it can only be adopted with perfect confidence, as regards the safety

of the patient, when nothing is done to prevent the free escape of the fluid from the vagina.

The intra-uterine douche, which is generally known as Cohen's method, was first recommended by Schweighäuser in 1825. It was originally introduced as an improvement upon Hamilton's process, as, in its operation, it more thoroughly and effectually separates the membranes from their uterine attachments. Abundant proof has been afforded that this is an effective plan, but it remains for our consideration whether or not it is to be admitted as a safe one. Dr. Barnes has collected no less than ten cases in which a fatal result ensued from the employment of the uterine douche, in some from shock, in others, as has been assumed, from the passage of the injected fluid through the Fallopian tubes into the abdominal cavity, and in others, as in a case which he quotes from Ulrich, by the entrance of air into the circulation through the uterine sinuses. In two cases mentioned by Simpson, the cause of death was rupture of the uterus. "The occurrence," he says, "of the rupture was to be explained by the fact, that the uterus, being already fully distended, could not admit the few ounces of fluid without being stretched and fissured to some extent; and during labor these slight fissures might easily be converted into fatal ruptures. In one case, the patient died before labor was completed; in the other, in twelve hours after its termination." It has also been urged by the same authority, that the placenta may be detached by injection; and that the position may possibly be altered, so as to change a cranial into a transverse presentation.

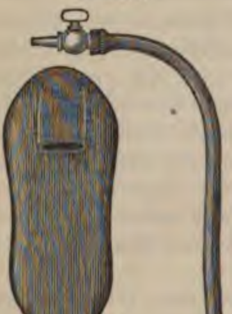
While we cannot wonder that the methods above described have received much support from influential quarters, we fear that such results as have been reported must be taken as a sufficient warrant for the absolute condemnation of the syringe as a means of inducing labor. Some doubt may be admitted as to the original plan of Kiwisch; but, when this is combined with forcible distension of the vagina, by preventing the escape of the injected fluid, which is tantamount to Çohen's method, we feel that no evidence of mere efficiency, nor accumulation of successful results, will warrant us in exposing a patient to such danger, while, undoubtedly, safer means are at our command. Injections of carbonic acid gas, and of common air, within the cavity of the uterus have also been practiced, but with such results as to deter any one from such expedients in all time coming.

7. The most recent method of inducing premature labor, is that which was suggested about ten years ago by Dr. Barnes, of dilatation of the os and cervix by means of graduated fluid pressure. A similar mode of procedure had previously been attempted by Dr. Keiller and Mr. Jardine Murray, but it is to Dr. Barnes that we certainly owe the complete scheme of cervical dilatation, which is in the present day gradually making its way into practice. The plan originally propounded by Dr. Barnes commenced by forcible dilatation of the os uteri, and was one, therefore, to which the French opponents of the general scheme would have applied their favorite term *accouchement forcée*, with the full weight of the contemptuous epithet; and to the modified procedure which he now advocates the same term might still, in a modified sense, be applied.

His process now consists of two stages,—*provocative* and *accelerative*. For the first of these, and for reasons similar to those which have been advanced in the preceding pages, he prefers the fourth of the methods which we have described. Overnight he passes an elastic bougie six or seven inches into the uterus, and coils up the remainder of the instrument in the vagina. Under favorable circumstances, some uterine action will have been set up by the following morning, and if not, it must still be left *in situ* for a time, until it is evident that the provocative action has been established. "Before rupturing the membranes," he says, "adapt a binder to the abdomen, and let this be tightened, so as to keep the head in close apposition to the cervix. This will often prevent the cord from being washed down by the rush of liquor amnii. Dilate the cervix by the medium or large bag, until it will admit three or four fingers. Then rupture the membranes, and, before all the liquor amnii has escaped, introduce the dilator again, and expand until the uterus is open for the passage of the child. If the presentation is natural, if there is room, and if there are pains, leave the rest to Nature, watching the progress of the labor. If these conditions are not present,—and one or other is very likely to be wanting,—proceed with accelerative methods,—that is, to the forceps or turning; or, in cases where the passage of a live child is hopeless, to craniotomy. By pursuing this method, we may predicate, with great accuracy, the term of the labor. Twenty-four hours in all—counting from the insertion of the bougie—should see the completion of the labor. The personal attendance of the physician during two hours is generally enough. The mode of proceeding must vary according to the conditions of the case." Writing in 1862, he says: "It is just as feasible to make an appointment at any distance from home to carry out at one sitting the induction of labor, as it is to cut for the stone."

The fiddle-shaped bags referred to in the above extract are of the form shown in the accompanying illustration. They are so constructed as to be grasped in the middle or constricted part by the os and cervix, which prevents them from slipping upwards into the uterus, or downwards into the vagina. Their introduction is effected by means of the little cup-shaped pouch which is attached externally, into which the point of the uterine sound may be adapted, and from which it may subsequently be withdrawn. Being first emptied of air, and folded upon itself, the stop-cock at the end of the tube is closed, and in this shape it is passed through the cervix. The nozzle of a syringe, which has previously been filled with water, is now adapted to the tube, through which the fluid is cautiously injected. After moderate dilatation of the bag, the stop-cock is closed, and the syringe removed, when the bag will be found to be firmly fixed in its place. A little practice, as we have learned by experience, is necessary

FIG. 175.



Barnes's uterine dilators.

in the management of this instrument, and especially of the stop-cock; but a close observation of the apparatus, and a few test-experiments before its introduction, will obviate any difficulty, and will at the same time serve to insure the efficiency of the bag. The process of subsequent dilatation should be gradual, and is effected by repeated injections, which, while increasing the size of the bag, exercises a pressure or dilating force upon the cervix, which is perfectly equable, and which is a pretty close imitation of the manner in which nature effects dilatation by means of the sac of the liquor amnii. It may be necessary to use successive bags, which progressively increase in size; or, in the absence of a sufficient assortment, two bags may be simultaneously introduced, and successively dilated, until the requisite amount of distension is attained. The only objection which occurs to us, as one which may possibly be urged against the use of this contrivance, is the chance of the displacement of the presenting part, by the expansion within the uterus of the fundus of the bag; but, in so far as experience has gone, in the hands of the inventor, or of those who have adopted his process, it does not appear that this objection has been experienced in actual practice. For our part, we have more than once had occasion to use the apparatus, and so far as a limited experience may entitle us to form an opinion, we can, in every respect, corroborate the assertions which have been made in its favor.

The methods of inducing premature labor which have been above detailed do not, it need scarcely be said, embrace all that have been suggested and practiced. At a very early period of the controversy, Galvanism was looked upon by some as an agent from which important results might be expected; but, although this is a powerful and undoubted provocative to uterine contraction in some cases, as has been shown by Dr. Radford and others, it is so uncertain, that its use has now been abandoned,—as has also been the case with regard to many other expedients, from which at one time brilliant results were looked for. Scanzoni has suggested an ingenious, but rather fanciful method, depending upon the well-known sympathy which exists between the mammæ and the uterus. He has applied—and in two cases, at least, with success—an apparatus of the nature of an exhausting syringe, or sucking-pump, over the nipple for about two hours, the irritation thus produced being propagated by sympathy to the uterus. Most of the other methods suggested are either modifications of processes already described, or are not of sufficient importance to require special consideration.

The condition of the ovum, the uterus, and the system generally, in reference to this operation, are obviously points of no little importance. The question of viability or non-viability of the fœtus, having been determined by the period of pregnancy, the fitness, anatomically and physiologically, of the maternal parts, and, indirectly, of the general system of the mother, naturally attract attention. In deciding upon the operation, we necessarily resolve upon a proceeding which, in a manner, takes Nature unawares. The condition of the cervix, and the extent to which its cavity has been encroached upon, at various periods, in the course of pregnancy, have been fully referred to in a previous chapter. It is but natural, therefore, that we should anticipate difficulties, in proportion to the extent to which the case is removed from the full term of gestation. But, in practice, it is truly wonderful how nature seems to adapt herself to the exigencies of the case; for, not only do the parts yield, to an extent upon which mere speculation would not entitle us to rely, but the whole system seems to lend itself to our purpose. The breasts enlarge, and milk is secreted, after the seventh month at least, and often earlier, for the sustenance of the infant, just as if pregnancy had run an uninterrupted course. The dangers of parturition may be to some extent, but, in truth, are scarcely sensibly augmented, nor are certain after-effects of mature parturition—which have yet to be detailed—much, if at all, more likely to accrue.

This brings to a conclusion what is generally termed Operative Midwifery. The various modes of procedure which, in this and previous chapters, have been described, do not, of course, include every skilful *tour de main* which the experienced or ingenious practitioner will, under special or peculiar circumstances, adopt. The object of the author has been rather to point to general principles, than to elaborate details to which the increasing scientific accuracy of the art is daily giving precision.

CHAPTER XXXV.

LABOR OBSTRUCTED BY MATERNAL SOFT PARTS.

RIGIDITY OF THE OS: USE OF BELLADONNA: FORCIBLE DISTENSION: INCISION IF OS OCCLUDED—EFFECTS OF UTERINE DISPLACEMENT—ABNORMAL CONDITIONS OF THE VULVA AND OF THE VAGINA: RIGIDITY: PERSISTENT HYMEN: CICATRICES FROM SLOUGHING: TREATMENT OF THESE CONDITIONS—VAGINAL THROMBUS—UTERINE POLYPUS; MANAGEMENT OF, WHERE IT OBSTRUCTS LABOR—OVARIAN TUMORS—FECAL ACCUMULATION IN THE RECTUM: RECTOCELE—DISTENSION OF THE BLADDER: CYSTOCELE—STONE IN THE BLADDER AN OCCASIONAL IMPEDIMENT—HERNIÆ—OTHER TUMORS WHICH MAY IMPEDE LABOR—MALIGNANT DISEASE OF THE CANAL.

IN treating of the management of natural labor, various obstructions, arising from the condition of the soft parts, were necessarily alluded to. The form under which obstruction of this kind most frequently presents itself is that of Rigidity, either of the os uteri or of the perineal structures. Generally speaking, this is an occurrence which exists quite independently of any diseased condition of the parts, and is, in fact, a purely functional lesion, yielding, as all experience has shown, to time; or to bloodletting, tartar emetic, chloroform, and the warm bath. Such obstructions as this may exist in every conceivable degree, from that which causes but trifling delay to the more obstinate forms which only yield after long-continued, and possibly exhausting labor. But, in addition to these, there are yet other cases in which the obstruction of the os is of a more serious nature, depending either upon peculiarity of structure or actual disease; and it has been in cases such as these, as was before mentioned, that the force of the uterine contraction is such as, in some rare instances, to separate the os and cervix, in the form of a ring, from the rest of the uterus; or, in some more common way, to produce rupture of the organ.

There are some cases in which there seems to be actual occlusion of the os, such as is sometimes observed in the unimpregnated uterus. Impregnation in the case of an absolutely occluded os is as impossible as that the normal function of menstruation should be carried on; and, therefore, we must assume, in such cases, that the closure must have taken place subsequently to the entrance of the seminal fluid. It is, of course, possible, that the os may remain open to a very limited extent, and yet the state of the tissues render distension impossible, so as practically to constitute an impediment as insurmountable as actual occlusion would be. In cases of anteversion of the gravid uterus, which is associated with pendulous abdomen, one result of the displacement is that the os uteri is tilted upwards and backwards beyond the reach of the finger, a condition which might readily enough be mistaken for occlusion, unless the observer should take the precaution to introduce the hand within the vagina, so as to explore thoroughly that part of it which is towards the hollow of the sacrum. Injuries, the result of former labors, the indiscriminate use of cauterants, and some other similar causes, may give rise to a species of callous rigidity, which is scarcely to be overcome by any means short of actual incision; and, in the worst cases of all, in which the tissues are the seat of induration from cancerous disease, the barrier may be so impassable as to render necessary the desperate expedient of the Cæsarian Section.

If, in an obstinate case of simple rigidity, the ordinary means of bleeding, tartar emetic, &c., have failed, we might try belladonna in the form of injection, the use of which has been much extolled by the French accoucheurs; but this is an expedient which is to be resorted to with caution, as faintness, headache, vertigo, and the other constitutional effects of the drug, are apt unexpectedly to be induced. The cases, according to Cazeaux, in which belladonna is most likely to do good, are those in which there is not rigidity, but spasmodic contraction of the fibres of the neck, an active and not a passive force. Although the os may, in ordinary cases, with scarcely an exception, be readily detected by the finger, it would appear that there are instances in which, although it has been impossible to feel it, its presence has been revealed to the eye by the speculum. This at least is an assertion which has been made by some whose opinions must always command respect, but it appears to us that the difficulty of using the speculum in labor, and the impossibility of recognizing the os when, in cases of difficulty, it is high in the hollow of the sacrum, must render this mode of investigation a very unsatisfactory one. The treatment of labor obstructed in this way may come to be a matter involving considerable perplexity. If the os, or the situation where surrounding induration marks the point at which it has become occluded, can be discovered, mechanical means, such as sponge-tents, and the like, must be used for its dilatation; but when no aperture whatever can be distinguished, even when uterine action has been in operation for some time, so as to bear upon the inferior segment of the uterus, no course remains for us but to incise the organ at its most dependent part, so as to avoid the danger with which the woman is threatened.

The necessity for such an operation being once recognized, no advantage, but the contrary, will ensue from delay. Beyond a certain degree of uterine effort, all that is essential is the presence of such pains as may secure the passage of the head so soon as a channel is opened up for it. The effect of delay, indeed, in such a case, would be to incur the danger of rupture of the uterus, and to allow the period to pass at which the patient is best able to bear the continued strain entailed by the ordinary phenomena of propulsive labor. In so far as the operation is concerned, the incision should be made from before backwards by a blunt-pointed bistoury, or by a series of incisions radiating from the real or imagined site of the occluded os. Great care should, of course, be taken not to wound the rectum or bladder; and the reason why the antero-posterior direction is preferred is, that the uterine arteries may with certainty be avoided. The incision should be made to a limited extent only, for the breach being once effected, and uterine effort being present, the head will, partly by stretching and partly by tearing, open a passage for itself as it is forced onwards. A number of morbid conditions of the os and cervix have occasionally been observed to cause serious obstruction to labor. Of these the most important is, of course, cancer; but there are cases in which induration and hypertrophy of the whole cervix, or it may be of the anterior lip only, has constituted an impediment scarcely less formidable. In some instances it would appear that the cause of obstruction may be an hypertrophied and elongated condition of the cervix, as in a case reported by Mr. Roper, in the "Obstetrical Transactions" for 1866. In such a case the expansion of the uterus is permanently arrested at the os internum, and the cavity of the cervix is thus not at all encroached upon when the full term of pregnancy has arrived. The treatment proper to such a condition would be dilatation by means of sponge-tents, or by air- or water-bags. Abscess and thrombus of the lips of the os have also been encountered as rare impediments to the passage of the child.

The more important displacements of the gravid uterus have already been spoken of; and from the observations then made, the influence which such malpositions may exercise upon the course of pregnancy may be in a great measure inferred. The effect of displacement forwards—anteversion or anterior obliquity—of the uterus must necessarily be to throw the os backwards; and, at the same time, the axis of propulsive action deviates from that which is normal in proportion to the extent of the displacement. If, along with this, there is any contraction of the pelvic brim, the result of the misdirected force may be that the head does not become engaged in the cavity, and that the anterior and inferior part of the uterus is exposed to injurious pressure. This condition of matters—which is recognized by a combined abdominal and vaginal exploration—may best be remedied by raising the depressed fundus, and maintaining it in that position by a bandage. In this way the axis of the uterus is brought more into coincidence with that of the brim—a result which may be still further insured by a supine position.

Posterior and lateral obliquities have also been noted as impediments to delivery; but to these unnecessary prominence is given by most Continental authorities. In the former case the os will probably be discerned in front, behind the symphysis; and in lateral obliquities, of which, for obvious reasons, the displacement of the fundus to the right is the most frequent—the os will be directed to the opposite side. Although practical difficulty from this position is rare, it may happen that the head remains above the brim, while the shoulder which is lowest in the uterus, slipping down, becomes the presenting part.

An abnormal condition of the vulva and vagina, congenital or otherwise, may sometimes cause serious obstruction to the course of labor. Union of the labia and nymphæ may exist to a greater or less extent, and as the smallest possible vaginal orifice is all that is essential to impregnation, an obstacle of this kind, whether congenital or the result of cicatricial union and contraction, may require the aid of art. The persistence of the hymen is another condition of a similar kind, which has sometimes been observed to such an extent as to constitute an impassable barrier. An extreme rigidity of the external parts has been noticed, chiefly in the case of women who become pregnant for the first time, either at an advanced age or very young. This rigidity of the perineum will generally yield to the vigorous pressure of efficient labor pains; but it sometimes happens that the resistance is obstinate, and requires assistance. In all these cases incision should not be practiced until the head has descended to the perineum, and then only to such an extent as may be absolutely necessary, remembering always that a trifling incision thus made will be extended as the head advances.

Our anxiety, in such circumstances, would be chiefly directed to the perineum, a laceration in which may, as we have seen, prove a very serious matter, by running back into the rectum. In order to avert such a catastrophe, therefore, we should make the incision, not in the middle line, but on either side, so as to direct the tear laterally and not posteriorly; and, even when such lacerations may have a formidable appearance at the moment of birth, they will rapidly contract, and a few days afterwards will be no longer visible. If the obstacle depends —whether in the vagina or at the orifice—upon contraction which is the result of disease or previous laceration, the difficulties of the case may be very great. Not unfrequently, the cicatrices are formed of strong ligamentous bands, which prevent the distension of the vagina, and may even pass across from one side of the canal to the other as imperfect septa. It has been recommended, when this is recognized early, that gradual dilatation should be attempted by means of tents or bougies. In the minor cases, the stricture will ultimately yield before the pressure which, during labor, is brought to bear upon it from within; but, in the worst cases, operative interference will be required. It has been found that free incision of such vaginal cicatrices is apt to be followed by serious hemorrhage. What, therefore, is a much safer plan is to act in the same manner as we have recommended in incisions practiced at other portions of the parturient canal. A number of superficial incisions, or scarifications, parallel to the axis of the vagina, will, when the head descends, yield, and admit of tearing, which should be effected to such an extent only as may be necessary for its passage. Such tearing is, of course, free from the ordinary risks of hemorrhage; but a moderate amount of bleeding is, perhaps, rather to be desiderated than otherwise, as it will tend to promote relaxation of the parts. The division of bands or septa may be conducted upon the same principle; and it has been recommended that we should partially divide them cautiously during a pain, even allowing the knife to be forced by the pain against the obstruction. If it does not speedily yield, the finger may be used freely to encourage the tearing asunder of these structures, using the knife as little as may be practicable. In this way the difficulty will gradually be overcome, and the descending head will make its way, or may even be assisted by the forceps.

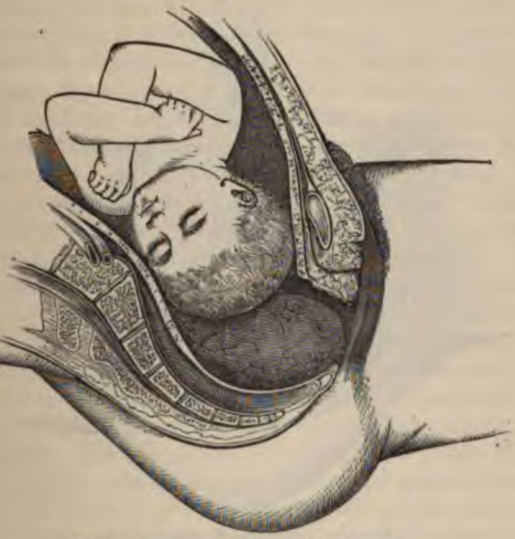
The vagina may be very small, or contracted congenitally at some part of its length, or in its whole extent,—the canal, although sufficient for the purposes of impregnation, or menstruation, being utterly inadequate for the function of parturition. Should such a condition as this call for operative procedure, it will be necessary to give relief to the constriction by cautiously combining tearing with incision, as in the cases of contraction from adhesion, adopting such means as may be best suited to protect the adjoining hollow viscera from injury.

Again, the soft parts may be the seat of diseased conditions, giving rise to Tumors of any portion of the canal, which may prove mechanical impediments to labor. Œdema of the vulva has already been mentioned as an occasional result of pregnancy, and it would appear that sometimes this exists to such a degree as to constitute a mechanical obstruction. Thrombus of the vagina,—which is observed both during gestation and after delivery,—occasionally, by its unusual development, bars the passage of the head, and at the same time presses injuriously upon the bladder and the rectum. These tumors, depending as they do upon the rupture of bloodvessels, usually make their appearance suddenly,—a diagnostic feature which is of considerable importance. Sometimes the blood infiltrates the cellular tissue, and at other times it is accumulated within cavities which it forms for itself; and, in the latter case, a certain degree of modified fluctuation will probably be observed, while the pain by which the original tumefaction has been accompanied, and the bluish color which the tumor exhibits externally, will generally suffice to indicate, with precision, the nature of the case.

The prognosis of vaginal thrombus, whether occurring during pregnancy, labor, or at a more advanced period, is very serious. "Of sixty-two cases," says M. Deneux, "which have come to my knowledge, the mother has succumbed in twenty-two; and, with the exception of a single case, the children in those twenty-two cases were lost." In cases which prove fatal, the loss of blood seems to be the immediate cause of death, but in those instances in which the primary risk is avoided, gangrene or suppuration may ultimately be the cause which leads to the fatal result. We have at present nothing to do with the treatment of thrombus occurring during pregnancy or after labor, but in those cases in which it constitutes an actual obstacle to delivery, nothing is open to us beyond free incision, which may be made in the most dependent portion of the tumor, and of such size as its dimensions may seem to render necessary. The immediate effects of gangrene and suppuration, and their probable results, will, of course, in such a case, excite, and with good cause, the serious apprehension of the accoucheur. Among the other tumors which may be encountered during labor, we may mention, in addition to those which have already been detailed, phlegmonous enlargements, cysts, syphilitic vegetations, and such tumors as have been figured by Martin in his "Atlas," as due to hypertrophy or degeneration of the nymphæ and preputium clitoridis,—all of which must be managed on ordinary surgical principles.

Polypoid tumors, springing from the uterus, may sometimes constitute very serious obstacles to delivery, as is here shown. The mere existence of a tumor of this character is not, however, to be accepted as evidence of a condition which absolutely prohibits the passage of the child, as much will depend upon the mobility as well as the compressibility of the tumor. In a case published by Dr. Beatty, to which Dr. Churchill refers, "the tumor was so large and apparently so fixed, that Cæsarian section was anticipated; nevertheless, at the time of labor, it was elevated sufficiently to allow of the birth of the child without any assistance." In some cases of polypi with a narrow pedicle, the effect of continued pressure and extensive effort has been to detach

FIG. 176.

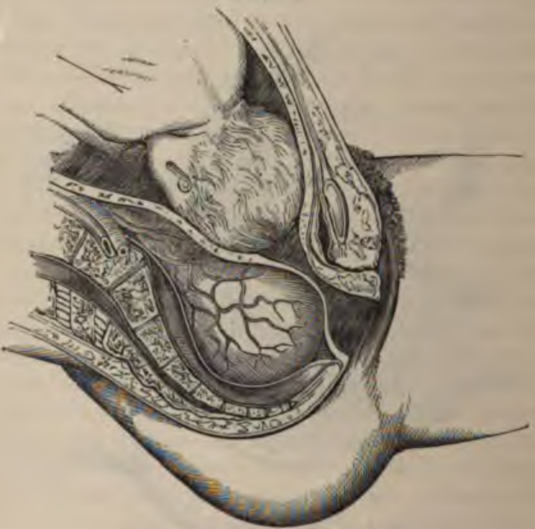


Uterine polypus as an obstacle to delivery.

the growth, and expel it in advance of the child. The management of such cases will depend, in a great measure, upon the conditions already mentioned. If, for example, it is movable, and the head has not yet descended into the pelvis, so as to render such a result impossible of attainment, we should try, as has in some instances been done with success, to push the tumor upwards during the interval between the pains, and retain it in its elevated position until the head takes precedence of it in its descent. Should this, however, fail, the nature of the tumor being undoubted, the proper treatment will be to remove it, which may be effected with the least possible risk by means of the wire-rope écraseur.

In some cases of ovarian disease, the tumor, instead of developing upwards, as is usual, in the direction of the abdominal cavity, falls downwards into the pouch of Douglas, betwixt the rectum on the one hand, and the uterus and vagina on the other. Such a condition will, no doubt, as a rule, give rise to abortion or premature labor; but, as the system is often slow to respond to such influences, it may happen that pregnancy, under these circumstances, goes on to the full term. In such a case as this, the obstacle, mechanically speaking, is much the same as in the case of the uterine polypus just alluded to, as is shown in the accompanying figure. The anatomical relations of a tumor such as this are widely different from the other case, as it is to be reached, not within the vulvo-uterine canal, but by perforation of the peritoneum either from that side or from the rectum. Such tumors vary considerably both in size and form, and the first point therefore, upon which it is necessary to decide is, whether or not it is of such a nature as to constitute an impossibility, or merely a difficulty, in the passage of the

FIG. 177.



Ovarian tumor obstructing delivery.

fœtus. This will depend in a great measure upon the structure of the tumor. Such growths are, as is well known, most frequently cystic in their nature, and, consequently, admit of a considerable amount of flattening, which would also be encouraged by the elasticity of their walls. The benefit of this mechanical advantage may, however, be lost by the nature of the pressure which is exercised by the advancing head; for if the higher part be firmly pressed, as is quite possible, between the head or other presenting part and the pelvic brim, so as to bring the walls of the cyst into complete apposition, the lower portion may bulk still more prominently during a pain, and be rendered at that moment harder and more resistant. We should not, in such a case, confine ourselves to vaginal exploration, but endeavor, by the introduction of one or more fingers into the rectum, to ascertain the nature of the case, with such precision as may be possible under the circumstances.

The treatment applicable to these cases must obviously depend upon the information to be derived from such examination as may be practicable. If the volume, seat, and nature of the tumor seem to encourage the belief that the force of nature may prevail, we should do nothing further than, by securing an empty condition of the bladder and rectum, make sure that no extraneous influence exists which may further complicate the acknowledged difficulties of the case. If, however, a purely expectant treatment should not result in the progress which we desire, it will be proper to attempt to push the tumor beyond the upper boundary of the pelvis; but if it should show a tendency to fall back, which it will generally do during the interval between the pains, we may attempt to retain it in such a position as may enable us to apply the forceps or to introduce the hand for the purpose of version, in which latter case the arm of the operator in the vagina will prevent the tumor from again descending towards the floor of the pelvis.

In cases in which the descent of the head, or the existence of adhesions, renders any displacement of the tumor impossible, it is even of greater importance that we should recognize, what is not always an easy matter, whether or not it is cystic. If so, and we leave it to nature, the result will probably be either rupture and escape of its contents into the cavity of the peritoneum, or a violent inflammatory action, the result of pressure. The puncture of such cysts from the vagina, as advised by Merriman, has been practiced with perfect success, and is obviously the only method of treatment which is open to us. To obviate the possibility of an error in diagnosis, an exploratory trocar should, in the first instance, be passed into the tumor, and when its nature is thus conclusively demonstrated, a larger trocar and canula may be employed, and the contents as thoroughly as possible evacuated. Complete success can, under such circumstances, only be counted upon when the cyst is unilocular; but, when it is a multilocular cyst, or the contents are unusually thick, it has been found necessary, in order to lessen the tumor, to incise from the vagina, a mode of procedure which, although dangerous, is probably less so than the doubtful results of the accidents which we have indicated as likely to supervene. Some have proposed puncture by the rectum; but, as the dangers of this operation are greater than the other, it ought to be rejected, unless, perhaps, under very peculiar circumstances.

When the tumor is solid, the difficulties of the case are greatly increased. In such a case, it being impossible to push back the tumor, we have to balance the chances of embryotomy or the Cæsarian section against an operation which has for its object the separation and removal of the growth. Merriman recommends that if we can convince ourselves of the absence of serious adhesions, we should proceed by the method of extirpation; but, putting aside the difficulty of determining this point before the operation has actually been commenced, we fear that this procedure can seldom be justifiable. If the tumor be of such a size as to leave an available gap of an inch and a half, or two inches in the pelvis, the operation of craniotomy would, we think, with the improved appliances now at our command, afford a much better prospect of success; and, even when this hope is denied us, we believe that the Cæsarian operation, if timeously performed, would give the patient a better chance than removal of the tumor, and might at least have the effect of saving the child. The result of all these operations has, however, been extremely unfavorable.

An accumulation of hardened fæces in the rectum has occasionally proved a very serious obstacle to labor. Such a condition can, of course, only happen where there has been great carelessness, and neglect of the function, so as to permit the lodgment of such a mass within the rectum as may actually bar the advance of the head. The treatment obviously indicated in such a case, is the relief of the bowels by means of emollient enemata; but, should these fail, owing to the size or extreme induration of the mass, it may be necessary to scoop out, or otherwise remove the contents of the rectum, and in one way or other the tumor will usually be dissipated without difficulty. The only other affections of the rectum which may be supposed to impede delivery is scirrhus, which has seldom been observed of such a size as to form a serious obstacle, and rectocele, in which the lower part of the gut protrudes into the vagina.

On the opposite side of the vaginal canal, the condition of the bladder may exercise an obvious influence on the progress of the case. The importance, not only in obstetrical operations, but in ordinary practice, of attending to that viscus, so as to protect it from the effects of distension, is a point, as has already been repeatedly mentioned, of the highest importance, as neglect of this not only endangers the bladder itself, but also may form an obstruction to the progress of the case. Cystocele, as an impediment to labor, consists in the protrusion of the neck and lower part of the bladder in the direction of the vagina, forming a tumor of such size as to prevent the passage of the head. The idea usually entertained of this seems to have been that it is due, in a great measure, if not entirely, to neglect of the usual precautions for insuring the evacuation of the bladder; but we are at one with Dr. Tyler Smith in supposing that this, although a possible cause, is certainly not the usual one. Prolapse of the bladder is by no means an uncommon, and is sometimes a very troublesome affection, in women who have borne large families; and, when a woman in whom this occurs becomes pregnant, we may be pretty sure that unless special care be taken at the time of delivery, difficulties are extremely likely to arise. The impediment will best be obviated by the opportune use of the catheter; and, if the cystocele already exists as an obstruction, care must be taken to pass the catheter backwards into the tumor, or to raise and press upon the latter so as to insure its evacuation. Caution must be exercised in the diagnosis of this affection, for it has happened that the fluctuating sac has been mistaken for the membranes, and perforated with the view of giving exit to the liquor amnii, the assumed cause of the obstruction. It has also been mistaken and punctured, in a case reported by Merriman, for a hydrocephalic presentation.

An interesting illustrative case, in which the tumor was of considerable size, is narrated by Madame Lachapelle. "The first thing," she writes, "that attracted attention was a pediculated tumor, about the size of an egg, which, projecting a little from the vulva, seemed to be attached to the anterior and right wall of the vagina, about its middle part. The pedicle was about an inch and a half in thickness, and the tumor contained a fluid which could be completely pressed out of it through the pedicle, when we were able to feel an aperture with thickened borders, which appeared to me to communicate with the bladder. In reference to the position of the woman, it was found that the tumor increased in size in the erect posture; it often disappeared after micturition, and was always retracted under the influence of a cold bath. The uterine contraction increased the volume of this hernia, and the head, in its descent, pushed it in advance, and stretched it strongly. I reduced it after having emptied the bladder, and I recommended the pupils to support it with two fingers during each uterine contraction. The head soon cleared the passage, and itself retained the hernia, and the labor terminated happily."

A urinary calculus may, of course, coexist with the pregnant state, but will usually produce no effect, mechanical or otherwise, upon the progress of gestation. In rare instances, however, it has been found that the stone has been so placed as to be imprisoned in the lower segment of the bladder by the pressure of the head of the child against the pubis. The advance of the head still further tends to confirm this position, and ultimately the stone, encroaching as it does upon the calibre of the pelvic canal, constitutes a serious impediment to delivery. The diagnosis is not always easy, but if the tumor behind the pubis is hard, circumscribed, and evidently situated beyond the pelvis; if it is fixed during contraction, and movable during the relaxation of the uterus, the symptoms are sufficiently significant to indicate the use of a sound, which will at once disclose the nature of the case. The circumstance in which a calculus is most likely to be an obstacle to labor is when it is complicated with vaginal cystocele—an anatomical condition of the parts obviously favoring the descent of the stone by gravity. Smellie gives among his cases that of the wife of a coal porter, who, having long suffered from the symptoms of stone, became pregnant. She was attended during labor by a midwife, who recognized the presence of a hard body in advance of the head; but her resources being limited, she was content to wait and watch the progress of events.

Ultimately a hard and rounded substance of considerable size was extracted from the vagina, which, on examination, was found to be a calculus of large size. The removal of the obstacle admitted of the immediate passage of the child, but the incontinence of urine, which remained, was undoubtedly due to vesico-vaginal fistula—an accident then considered irremediable.

The treatment of all such cases will consist—if the period has not already passed when this may be effected—in attempting to push the stone upwards into that part of the bladder which is above the brim, and, if necessary, retaining it there during the intervals between the pains, until the head shall descend, so as to prevent its slipping down again. If the head has already made some advance in its passage through the pelvis, it may still be possible to push up the stone by operating during the interval between the pains, if only we can displace the head a little so as to admit of its passage upwards. But if the calculus is so placed that it is impossible to dislodge it from its position, the case may become a very serious one, as the only remaining resource will then be the removal of the body which prevents the accomplishment of the function of parturition. The safest mode of procedure as to its immediate results would, under such circumstances, probably be the dilatation of the urethra and the extraction of the stone. Such an operation is, however, open to two objections. In the first place it can only be safely performed slowly—a condition which obviously does not suit the exigencies of the case; and again, it leaves most unsatisfactory results in a long continuance of incontinence of urine. It is probable, therefore, that the most judicious course would be, when the obstacle seems such as to preclude the possibility of safe delivery by the forceps or turning, to perform the operation of vaginal lithotomy, cutting down upon the stone through the neck of the bladder, and removing it in the usual way. The operation of lithotrity has also been suggested, but in so far as we are aware it has never been practiced.

Certain rare forms of hernia may coexist with pregnancy, and may even form impediments to the termination of labor. It is, it must be confessed, very unlikely that such tumors should, in any considerable degree, oppose the passage of the child; but there undoubtedly exists the more indirect, but not less serious danger, which arises from compression or strangulation of a hernial tumor, wherever situate. Such herniæ have been observed in the posterior part of the pelvis, the bowel, or omentum, or both, having descended, in the first instance, into the cul-de-sac of the peritoneum which lies between the vagina and the rectum, making its way downwards in the same direction, until it may ultimately protrude at the perineum, and form a perineal hernia; while, if it bulges into the vagina, it is a vaginal hernia. The protrusion may also take place from a different quarter, the bowel passing along the canal of Nuck, and ultimately forming a tumor in the labium of either side, which is anatomically analogous to scrotal hernia in the male. The diagnosis of these tumors will seldom cause much perplexity, if the case is one of ordinary enterocele; but, if it be constituted by the omentum alone, the absence of gurgling on reduction, and of other characteristic signs, may invest the case with considerable obscurity. The treatment in all cases is the same,—to practice the taxis, and maintain the displaced viscus in its proper situation while labor is in progress, with the object, as we have said, partly of preventing the possibility of mechanical obstruction, but mainly with the view of protecting the displaced parts from injurious pressure.

The various tumors which have been described do not, it need scarcely be said, embrace all the varieties of obstacle from these sources, which may be encountered as impediments to the progress of labor. Fibrous, fatty, or encysted growths may spring from any portion of the cellular tissue of the pelvis. The direction which these most frequently take, is that of the recto-vaginal pouch, but they have also been observed in the sides of the canal, and even between the uterus and the bladder. To distinguish such abnormal structures from those which have their origin in the tissues of the various organs which are situated in the pelvis will always be a matter of difficulty, sometimes of impossibility. Everything will depend upon the mobility and compressibility of such tumors, and the result, in many cases, will simply be an increased difficulty in the passage of the child, the forces of nature ultimately overcoming the obstacle.

But, in some cases, the volume and immobility of the tumor may be such as to preclude the possibility of any such favorable result; and, in that case, we may be forced to adopt such surgical means as may with the least risk get rid of the difficulty. If it is a cyst, it will be proper, therefore, to evacuate its contents; and, if solid, its size, shape, and the nature of its connection by adhesion or otherwise, must serve as our guides to such operative measures as, on general principles, the nature of the case seems to demand. Excision of such tumors is, of course, under these circumstances, an operation which is attended with peculiar risk: it has been practiced by an incision through the vaginal walls; and, in some other cases, with success, by a more extensive incision involving the thickness of the perineum. The worst cases are those in which the size of the tumor, its immobility, and the great extent of its adhesions, render such operations impracticable; and, in these, nothing will be left to us beyond the more desperate resources of operative midwifery.

Frequent reference has been made to malignant tumors as obstacles to delivery. The nature of this fearful class of diseases is such that the impediment may have its origin in the bones, ligaments, uterus, bladder, rectum, or any conceivable part or structure of the pelvic contents. Moreover, from a tumor of trifling size, it may attain dimensions which are only limited by the capacity of the pelvic canal; and the tendency of all malignant growths to invade contiguous textures frequently places the case in a category peculiar to itself, inasmuch as it is impossible to isolate it either for the purpose of removal or dislodgment. In the ordinary or scirrhous form, the stony hardness of the tumor, which is absolutely incapable of distension, the infiltration and infection of surrounding tissues, the binding together of the parts, the presence of ulceration, and the existence of marked cachexia, will generally render diagnosis a matter of no difficulty.

In the initiatory stage of the disease, the diagnosis will naturally be more obscure, and in cauliflower excrescence, and the rarer fungoid forms of malignant disease, the symptoms are very different from those above indicated, but are still sufficiently characteristic to enable us to form a definite opinion as to the nature of the case. From what has been said, it will be obvious that no surgical rules can be laid down for the management of cases such as these, whether the tissue primarily invaded be the labia, the uterus, or any other portion of the canal. The nature of the case and the extent of the obstruction can alone be our guides. Malignant atresia has repeatedly been overcome by incision of the diseased structures with success as regards delivery of the child; but, in those cases in which the disease is extensive, it will only remain for us to decide between the forceps and the other more serious operations of midwifery.

CHAPTER XXXVI.

OBSTRUCTION DEPENDING ON THE STATE OF THE OVUM.

HYDROCEPHALUS: DIAGNOSIS OF: MANAGEMENT OF SUCH CASES—SPINA BIFIDA—OBSTRUCTION FROM ASCITES, HYDROTHORAX, AND DISTENSION OF THE BLADDER—GASEOUS DISTENSION FROM PUTREFACTION—TUMORS SPRINGING FROM THE FŒTUS—ANCHYLOSIS OF THE JOINTS, AND INTRA-UTERINE FRACTURE—PREMATURE CLOSURE OF THE SUTURES—UNUSUAL DEVELOPMENT OF THE FŒTUS—SPECIAL DIFFICULTIES IN PLURAL PREGNANCY: LOCKED TWINS—MONSTERS WHICH IMPEDE DELIVERY; THE SIAMESE TWINS, AND OTHER SIMILAR CASES—SHORTNESS OF THE UMBILICAL CORD AS AN OBSTACLE—DORSAL DISPLACEMENT OF THE ARM—THICKNESS AND PERSISTENCE OF THE MEMBRANES.

It not unfrequently happens that, although the maternal parts are, in every respect, normal, and the position everything that may be desired, the relative proportions which should exist between the ovum and the canal are disturbed by an abnormal condition of the former. The peculiarities in structure which give rise to mechanical obstruction of this nature consist, mainly, of an increase in size, whether of the whole fœtus or of some of its parts, arising, in one class of cases, from faults of development, and in another, from the effects of intra-uterine disease. The peculiarities alluded to may affect either the fœtus itself or some of the other parts of the ovum; but no reference is here made to malposition of the fœtus, a subject which has already received full consideration.

The diseases of the child from which such unfortunate conditions spring, are those in which some one of its parts becomes the seat of such an increase in size as to constitute an impediment, more or less serious, to the progress of labor. Of these the more important are hydrocephalus, fluid distension of the great cavities of the trunk, and tumors of various kinds springing from its external surface. Hydrocephalus is, of all such affections, not only, as might be expected, the most important, from a mechanical point of view, but is so also in point of frequency. One form of this affection, or rather one which has been by many writers erroneously described as such, is an effusion of fluid beneath the scalp or pericranium, and, consequently, exterior to the cranial cavity. Examples of this, which has been termed external hydrocephalus, are very rare, and have usually been found to be associated with a general condition of infiltration affecting the whole of the external tissues of the fœtus. It is a condition which usually involves the life of the child, so that any serious impediment from a child which is in all probability putrid need scarcely be anticipated.

The internal variety, or what is known as true Hydrocephalus, is a much more serious as well as a more frequent occurrence, and may exist to such an extent as absolutely to preclude the possibility of delivery by the unaided efforts of nature. In this case, the fluid, which is effused within the cranial cavity, varies greatly in quantity. In those instances in which the quantity is small, the difficulties of parturition may not be materially augmented, as the compressibility of the head is, in consequence of the nature of its contents, relatively increased—a condition which obviously tends to facilitate its passage, and compensates for the actual increase of bulk. Owing to this, indeed, and associated probably with ample pelvic diameters, very large heads have been known to pass naturally. In some cases, the head, in consequence of the quantity of fluid which is poured out by the morbid process, attains enormous dimensions. When the disease is slow in its progress, the flat bones become developed to a very unusual extent, but when more rapid, the deposit of bone does not keep pace with the distension of the head, and the latter, under such circumstances, may present itself under the form rather of a bag of fluid than of an ordinary cranial presentation. The rule certainly is that the process of ossification fails to overtake that of fluid distension, and a marked characteristic, therefore, of hydrocephalic heads is that the sutures and fontanelles are more apart than usual.

When the size of the head is considerable, and the symptoms consequently well-marked, the recognition of hydrocephalus is generally easy enough. The presenting part, which in these cases is arrested above the brim, is found to be less resistant and less convex than usual. The sutures and fontanelles are, however, to be distinctly felt; and, if we can feel that the former are agape, and the latter of larger size than usual, with more or less of a feeling of fluctuation, there will be little room for doubt. The existence of a large posterior fontanelle is particularly characteristic; and, if the hand can be fully introduced, the great size of the head will be recognized.

This applies, of course, to those cases only in which the cranium presents at the brim. It often happens, however, in such instances, that the same reasons which, under ordinary or normal circumstances, cause the head to adapt itself to the smaller end of the ovoid cavity of the uterus, operate by so determining the position, that what is here the larger extremity of the fœtal oval lies in the fundus of the uterus, the pelvic extremity being the presenting part. The conditions being thus absent upon which alone our diagnosis can depend, no suspicion is entertained as to the nature of the case; and it is only when, after the head and trunk have passed the brim, and the head is there arrested, that suspicion is awakened, and the existence of hydrocephalus possibly recognized. For, in such cases, it is by no means an easy matter to make sure of this, as it is only a limited portion of the occiput which can be reached with the finger; but, if we find the pelvis of average dimensions, and are able to recognize a large head with its bones loosely articulated, and a trunk and limbs somewhat less in size than usual, we shall probably take these facts as sufficient collectively to warrant a confident decision. Another symptom which, when the head presents, has been insisted upon by Blot, is that while the head is absolutely arrested at the brim, the whole body of the fœtus is higher relatively to the abdominal walls; and, therefore, the pulsations of the fœtal heart may be recognized as high as, or even higher, than the level of the umbilicus.

The nature of the obstruction depends not merely upon the quantity of fluid effused within the cranium, but also upon the development of the flat bones, and the degree of compression of which the head is susceptible. These conditions may, however, with truth be regarded as subsidiary to another, which depends on the manner in which the head descends and becomes engaged in the pelvis. A mere bag of water (and the head is sometimes reduced mechanically to this condition) may, so long as it remains unruptured, be an impediment as insurmountable above the brim as an absolutely solid mass would be. But, if the conformation of the parts, and other conditions, should permit of the engagement of such a tumor, so that its lateral walls are efficiently compressed by the pelvic canal, matters are so completely altered, that an elongated oval, containing an equal bulk of fluid, may pass through the passage, where one which is spheroidal, or, with reference to the aperture of the brim, transversely ovoid, cannot even enter. It is, no doubt, on this principle that those cases have occurred, of which we read, where a child has been born alive, with a head measuring, in its circumference, twenty-two or twenty-four inches, whereas the normal standard is, on an average, about thirteen inches and a half.

While recognizing these facts, however, the operator must beware of trusting to such a result, unless he finds that the pelvis is ample, and the cephalic tumor is pointing downwards, thus giving indications of moulding itself to the pelvic canal. There are, perhaps, few contingencies in the practice of midwifery in which a careful and early diagnosis is of greater importance than here; for, however revolting the operation of craniotomy may be to a well-regulated mind, the more fearful risk of delay must be from the first admitted into our calculation. In seventy cases, collected by Dr. Thomas Keith, rupture of the uterus occurred in so large a proportion as sixteen; while, in every one of the five cases recorded by Dr. Robert Lee in his "Clinical Midwifery," the mother was lost either from rupture of the uterus, or inflammation of the organ, facts which—independently of many others corroborating the conclusion—point significantly to the danger that, in such cases, attends delay.

The indications of Treatment are, from one point of view, sufficiently obvious; but our action will, in no small measure, be swayed by the presence or absence of symptoms indicating the vitality of the child. If the child is dead, we do not require to wait for absolute certainty of diagnosis. Evidence of serious obstruction is all that, in such a case, we would think necessary to warrant us in perforating and giving vent to the fluid which is pent up within the cranium. But, when the child still lives, the responsibility which attaches to the operation is greatly increased, and the error which, in such cases, is most likely to be committed is that the operator may wait until the mother has become exhausted or the child has died; whereas, he ought to have sooner recognized the fact that the passage of a living or viable child was impossible, and have acted upon the principles which we have already laid down as applicable generally to cases of destructive or sacrificial midwifery. The immediate effect of craniotomy, in hydrocephalus, generally is to reduce the bulk of the head by the escape of a large amount of fluid, to an extent much greater than obtains when perforation is practiced under other circumstances. It may happen, as in some recorded cases, that the operation, as well as the diagnosis, may be complicated by the coexistence of what has been described as "external," along with internal hydrocephalus, when it may be necessary to evacuate the external accumulation of fluid before piercing the cranium. To such an extent does the distension sometimes occur that several pints of fluid have been removed by simple perforation, when collapse of the cranium usually takes place, so as to permit of the expulsion of the head under the influence of the natural efforts.

It has happened that, after perforation and evacuation of the serum contained within the cranium, the child has been born alive; so that, although the chances of a child surviving under such circumstances may be considered as extremely small, it has been urged by Cazeaux and others that the operation should be so performed as, if possible, to prevent laceration of the cerebral structures, and the inevitable sacrifice of the child which must thus ensue. It has been suggested, therefore, that, on this account, the ordinary perforating apparatus should be rejected, and a simple puncture effected, by means of a trocar or a guarded bistoury, sufficient to penetrate the membranes through a fontanelle or suture, and nothing more. From what has already been said, it will be apparent that, in the minor cases, any mode of procedure which may promote lateral compression of the head may, with possible advantage, be adopted in preference to craniotomy. With this in view, therefore, it is usual and proper to attempt delivery, in the first instance, by means of the forceps, when the compressing power of that instrument may be employed to a somewhat greater extent than is usual under ordinary circumstances; but, if this fails, and the circumstances of the case are otherwise such as to preclude the hope of expulsion by the unaided efforts of nature, the more serious operation should be practiced without delay.

If the difficulty should arise in a presentation of the pelvic extremity,—which occurs, according to Scanzoni, in one in five of all cases *of* hydrocephalus,—the operation is one which cannot be performed with the same facility. Various modes of procedure have been suggested as applicable to such cases. It has been found possible, for example, to reach the cranial cavity through the mouth, by piercing the base of the skull through the vault of the palate; and, in other cases, it has been successfully practiced through the orbit; but what, in such cases, we would recommend, in preference to either of these methods, would be direct perforation behind the ear, should it be possible to reach that part of the cranium for the purpose.

It has sometimes happened that the tumors which are connected with osseous deficiency of the cranium or vertebral column, and which are known to the surgeon as Crania Bifida, or Spina Bifida, have attained such dimensions as to prove an obstacle to delivery; in which case it may be necessary to perforate the tumor and evacuate the fluid which it contains. Effusions into the other great serous cavities of the body, although less frequent in their occurrence than hydrocephalus, render delivery equally impossible. In Ascites, the development of the abdomen is sometimes enormous, and is revealed by the fluctuation as well as by the size. The only affection of a similar kind with which we might possibly confound it, is distension of the bladder, which, when the urethra is impermeable, may give rise to a tumor of great size, which may require tapping equally with the peritoneal effusion. The description of such a case was communicated by M. Depaul to the Académie de Médecine, and this, it may here be observed, is, along with other similar cases, one of the most important points of evidence upon which physiologists rely in supposing that the urine of the fœtus is naturally evacuated into the amnionic cavity.

When the peritoneum of the child is distended with fluid, so as to prevent its passage, that cavity must be pierced by a trocar, and the fluid which it contains drained away by the canula. Hydrothorax is still less frequent in its occurrence. It is indicated by an enlargement of the thoracic region and intercostal bulging, and may require punctures to be practiced between the ribs, with precisely the same object as in the other case. In all these cases, the operation of perforation should be so performed as to avoid injuring the internal organs; for not only would this entail unnecessary mutilation, but might defeat our object, by preventing the escape of the fluid. The development within the body, as a result of putrefaction, of enormous quantities of gas, is a fact familiar to the medical jurist, and one which may take place within the womb as well as under other circumstances. In some rare instances, it has occurred that, in consequence of this, severe laceration has been inflicted, with a fatal result; and, in other cases, labor has been terminated ultimately by a rupture, which gave issue to the pent-up gas. No hesitation should, in such a case, deter the operator, as the evidence of the child's death will be otherwise complete, and he is bound to act so as to protect the mother from risk.

Tumors of various kinds may spring from the surface of the fœtus, or be developed in connection with some of the internal organs, and may, by attaining unusual size, render labor impossible of natural termination. Tumors have, for example, been observed, which had their origin in the liver or the kidneys, enlarging the trunk to an enormous extent, so as absolutely to prevent its passage, and render indispensable the operation of embryulcia, in the course of which it may be necessary to break up the tumor, and remove it piecemeal before we can complete the delivery. Another rare condition of the fœtus, which may be a very serious obstacle, is anchylosis of the articulations, and the same may be said of those cases in which there has been intra-uterine fracture as the result of violence, the limbs having united at an angle. It is difficult to say what, under such circumstances, should be done, if the condition has been recognized before birth: but, in so far as anchylosis is concerned, we may assume that the joints will probably be united while the limbs are flexed upon the body in the usual attitude of the fœtus, and that the conditions are therefore not altogether unfavorable to the natural termination of labor. A more serious impediment has been in some instances found to arise from premature closure of the sutures and fontanelles. This, in a perfectly normal condition of the parts otherwise, may give rise to great delay, if not impaction, by its being impossible for the head to adapt itself in any way to the shape of the passage; and, as Dr. Tyler Smith has observed, the dangers of such a condition are not limited to the mechanical hindrance to delivery, but may be looked upon as an extremely probable, if not certain cause of idiocy, by preventing the development of the brain.

The child sometimes, even when not retained within the uterus beyond the ordinary period of gestation, attains a size so greatly in excess of the ordinary standard, as to cause a very difficult or dangerous labor. If we take, as has already been stated in round numbers, the average weight of the fully developed fœtus as seven pounds, we are not astonished when we find in practice, that when this approaches twelve pounds the labor is, unless the maternal parts are of unusual capacity, a slow and painful one. But, when it reaches fourteen, fifteen, or nearly eighteen pounds (as in one well-known and authentic case already cited) it is difficult to conceive how by any possibility such a child could pass. If, however, we look closely at children which are much above the average, it will be observed that the increase in weight is to a great extent due to the development of fat beneath the skin, so that it is the trunk and limbs, rather than the cranium which is increased in size, and it is on this account that we find the powers of nature sufficient for the expulsion of the child. If the increase of bulk has been the result of a protracted sojourn of the fœtus in the womb, the case will probably be more serious in its nature; and, certainly, in all such cases, we may be sure that the maternal as well as the fœtal mortality will be increased relatively to the size of the child, as statistics tell us that this is the case, even as regards the comparatively trifling difference which exists between the male and female cranium. It is, however, very rare that, in the absence of pelvic deformity, cases of unusual fœtal development may not be delivered by the forceps or turning, which we may term the minor operations of midwifery.

The occurrence of Plural Pregnancy may in various ways give rise to difficulty, and even to serious obstruction. In the case of multiple pregnancy, the products of conception may be disposed in almost any manner compatible with the limits and mechanical conditions of the uterus; but it does not appear that any great difficulty has been met with, unless, in these instances, one or more of the children has been in a faulty position. The same remark applies to Twin Pregnancy. In the latter, the two children are most frequently observed to occupy each a side of the womb, with the cephalic extremities downwards, and one head somewhat in advance of the other. In a very considerable number, the head of one child and the breech of the other present; while, in rarer instances, the feet of both may be downwards, or one or both may lie transversely in the womb.

In plural pregnancy, the uterus, no doubt, acts at a certain mechanical disadvantage, inasmuch as its propulsive force is communicated to the fœtus which is lowest in the uterus—not directly, as in single pregnancy, but indirectly through the bodies of the others. But, as has been well observed, this disadvantage is usually fully compensated for by the comparatively smaller size of the children. The cases where delay is most likely to occur are those in which the breech of the first child is the presenting part; and, as this descends, the difficulties, as in ordinary cases, will be greatly increased by any unusual resistance at the outlet. And then, after the passage of the breech, the descent and birth of the head—a matter of difficulty, as we have seen, even in presentations of the breech in single pregnancy—is here so much more so that, unless the accoucheur was at hand to afford the assistance of his art, that child, at least, would be almost certainly sacrificed.

As has already been observed in an early chapter, when the subject of plural pregnancy was under discussion, there is very often a period of considerable delay after the birth of the first child. This is probably due, in many instances at least, to uterine exhaustion; and the pause which then ensues is a perfectly natural condition, which we should rather encourage, as it enables nature to recruit her exhausted forces, and thus bring them into renewed activity when the period arises for the expulsion of the remaining contents of the uterus. The recommendations, therefore, which are given by some authorities as to the circumstances which warrant, in such cases, operative interference, should be received with great caution, and only acted upon when the conditions are such as to indicate beyond the possibility of doubt that it is proper to aid or precipitate labor in any way.

But the most serious mechanical difficulty which may arise in the course of labor in plural pregnancy, is what has been described in the case of twin pregnancy as "locked twins." When the membranes are, as has previously been shown (see Figs. 91 and 92), so arranged that each child lies in its own complete sac, the expulsive forces act, even under such mechanical disadvantages, so as to expel one child first, and to leave the other still enveloped in its own amnion. The first birth thus takes place without any particular difficulty. But, if they are inclosed in one amnionic cavity, the parts of the two may fall into such a position as to make delivery a matter of the greatest possible difficulty. The most common form of locking is when the first child presents by the breech, and passes downwards up to a certain point without impediment; but when serious obstruction occurs, and we are thus led to make a more particular examination, it is discovered that the descent of the head is obstructed by the presence in the pelvic cavity of the head of the second child, which has caused the chins to be so hitched together that the completion of the first birth is rendered a matter of impossibility, unless the twins are small or the pelvis large. If, under such circumstances, we pull upon the body of the partially born child, we only make matters worse by locking them more firmly together. In some cases, when the condition of the parts is such as to admit of it, it may be possible, by pressing back the heads in the direction of the uterus, to unlock them, and then to permit of their descent singly. But, if this endeavor should fail, it will become evident that the only way to disengage them is to break up the compound wedge and thus admit of the passage of one or other of the children.

This may be effected in two ways, as has been well demonstrated by Dr. Barnes; either by decapitating the first child, which we have the least chance of saving owing to the pressure which is being exercised on its umbilical cord, or by perforating the head of the second child, so as to admit of the passage of the first. In the first case, the body which occupies the vagina will at once pass, and its head receding will admit of delivery of the second child by the forceps; and in the second, which is only justifiable when we have reason to believe that the other child is dead, we allow the perforated head to be flattened to such an extent as to admit of the passage of the head of the first, through the diameters which the operation has succeeded in reducing. This latter plan will have the obvious advantage over the former that the difficulty of extracting the severed head is thereby avoided.

There is another form of locking, in which both of the twins present —as is most frequently the case—by the head. The first head passes in this case without difficulty into the pelvis, but the head of the second, descending along with the trunk of the first towards the brim, prevents further progress by presenting the bulk of a head and a thorax simultaneously at the brim. The mechanical management of such a case as this may be a matter of even greater difficulty than the former. Perforation of the head which is within reach can obviously do no good, so that it is only by guiding the perforator upwards to the second head, and reducing its bulk in the usual way, that the operation may be, with any hope of success, adopted. In such cases, as has been shown by the experience of Dr. Graham Weir and others, it may be possible by dexterous manipulation to obviate the serious difficulties which exist. It has been found practicable in this way to extract by the forceps the child which originally presented while the head of the other was pushed aside by an assistant. External manipulation has also succeeded in skilful hands in forcing onwards the head which was situated highest in the pelvis, and thus causing it to take precedence of that which originally presented. All cases of locked twins are, however, serious complications, and are therefore with justice looked upon as among those dangers against which the operator should be prepared.

The first or second child may present in a preternatural manner,—

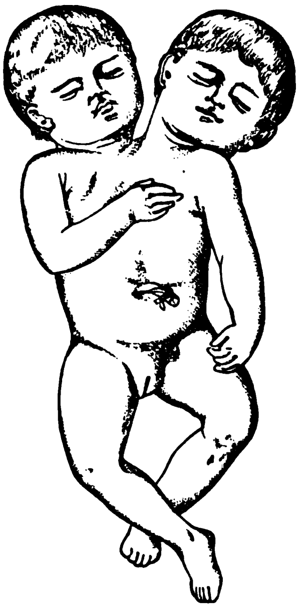
by the shoulder for example, as has before been explained—and in such a case, we have to beware of the mistake, which has been committed, of seizing the wrong foot or feet when the hand is introduced for the purpose of turning; and it may happen, as in a case narrated by Madame Lachapelle, that when turning has been successfully effected, and the breech extracted, locking by the chins may be the ultimate and perplexing result. It is to be borne in mind that, in plural pregnancy, there is a greater risk of hemorrhage, owing to the extent of surface to which the placenta is attached. And, in cases in which there is an inosculation of the cords, there is, at an earlier stage, another special risk, if we leave the placental portion of the severed cord untied.

Various forms of Monstrosity give rise to very great difficulty in the course of labor; and in extreme cases it is only possible to complete delivery by embryotomy or the Cæsarian section. We have here, of course, nothing to do with such departments of teratology as are illustrated by acephalic and anencephalic monsters; and still less with those which are anopic or cyclopic, as such conditions present no mechanical obstacle whatever. The many different forms of ectopy present, as a rule, little or no difficulty, but in the more complete form, as in a case figured by Vrolik, the whole of the thoracic and abdominal viscera are external to the child, and may impede its passage. It has been observed, in another form of monstrosity, that the liver projecting through the unclosed umbilicus (*Exomphalos*) has, by its augmented size, caused a serious impediment, which might well be expected to bar the progress of ordinary labor.

The forms of monstrosity which are, from the point of view of mechanical obstruction, the most serious, are those in which the two children in a twin pregnancy become fused together to a greater or less extent, the union or fusion being anatomically symmetrical. Infinite as the varieties of such cases are, this rule is never violated, and is indeed the only possible method of which the laws which regulate development can admit. Thus, we have union of sacrum to sacrum, occiput to occiput, or abdomen to abdomen; but never sacrum to occiput, or abdomen to sacrum. There may be one perfect trunk with two heads, as shown in the annexed cut (Fig. 178), which closely resembles a case of this kind, which we had an opportunity of seeing with Dr. George Mather; but the union may be even higher than the cervical vertebræ, when we have more or less fusion of the crania. In such a case as the one here represented, in which the size of the various parts was rather more than is usual at the full time, a mere glance will suffice to show, not only that labor must necessarily be impeded, but that it is scarcely possible, in a normal condition of the parts as regards size, that a natural termination should take place.

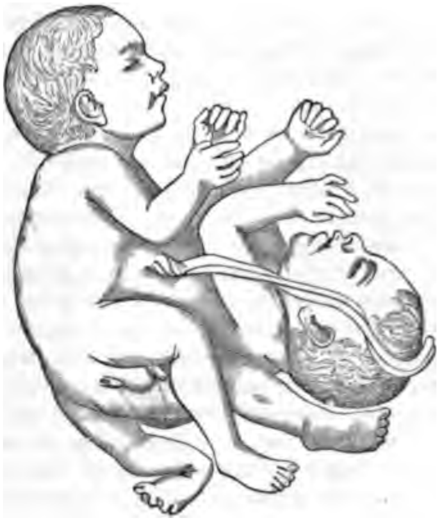
In a case which has been described by Meigs, one head descended first, and was delivered. It then became fixed under the subpubic angle, and the ultimate process of delivery was precisely similar to what takes place in the spontaneous expulsion of a transverse presentation, the trunk, breech, lower limbs, and, lastly, the second head, passing through the external parts. In the case to which reference was made above, delivery was accomplished with the greatest possible difficulty. It was a primiparous case, and the breech was the presenting part, everything going on well until the heads entered the pelvis, when complete arrest took place. The crotchet failed completely, and as Dr. Mather thought that the head was too high to use the perforator with safety, he attempted, by means of steady traction, to bring it more within reach, when, to his astonishment, two heads descended, situated obliquely, with reference to each other, in the pelvis, so that the one was a little in advance of the other. In this way, and after long-protracted efforts, the heads, which were quite the average size, passed. The pelvis was, as might have been expected, a capacious one; but even this does not make the case less interesting. The mode of delivery described by Meigs is generally supposed to be the only possible way in which such a child can be born without perforation or decapitation; but the case above given, which is extremely rare, if not unique, shows that if the other be the rule, it has at least, like many other rules, exceptions.

FIG. 178.



Double-headed monster.

FIG. 179.



Double monster.

In that class of cases in which there is one head and a double condition of the lower parts of the body (*Janiceps*), the difficulty is not likely to be so great, as it is much more conceivable that two pelves could be sufficiently pressed together during their descent as to admit of their simultaneous passage through the pelvis of the mother. The monster here shown, from one which was described by Dr. J. G. Walter, has three legs and four arms. Complete fusion of the pelvis was found on examination after death to have occurred, and there was also union of the ensiform cartilages. On first sight it may appear that delivery, in such a case, would be even more difficult than of the ordinary two-headed monster; but a little consideration will show that the possibility of one head at a time passing along the pelvis, gets rid of the greatest difficulty which attaches to this variety. The probability of a transverse presentation in such a case is, however, very strong; and this, of course, would be a most unfortunate circumstance, as turning and bringing down the feet would inevitably bring the heads together, and thus make matters worse than ever.

It has occasionally happened that twins, more or less completely united or fused together, have been born alive, and have even attained maturity. In the most familiar instance of this kind—that of the well-known Siamese twins—there is a mere band of union; but it is indeed difficult, in regard to this and other similar cases, to conceive even the possibility of birth, unless after mutilation or putrefaction; in fact, we can only suppose, in reference to such, that the maternal pelvis has been of unusual capacity, that labor has occurred prematurely, or that both of these conditions have been combined. Another comparatively rare form of monstrosity has been mentioned under "Twin Pregnancy" as monstrosity by inclusion; and, in this case, the tumor of the perineum, which contains the *fœtus in fœtu*, may be a serious obstacle. It will readily be understood—and the more so as they are of extremely rare occurrence—that such cases may cause great perplexity to the accoucheur, and, whether the diagnosis is accurately formed or not, cannot fail to be a very serious barrier to delivery. So various, however, are the forms under which monstrosities present themselves, that it is impossible to lay down any general rules which might serve for the guidance of the practitioner. A thorough knowledge of the mechanism of parturition, under abnormal as well as normal circumstances, is here of a very high importance; and it is upon such knowledge that the course to be pursued must necessarily be based. In a considerable number of cases, it has been found necessary to decapitate, eviscerate, and otherwise mutilate one or both of the united twins or repeated parts before it has been possible to relieve the woman of the contents of her womb. Care must, it need scarcely be added, be taken, not only to insure correctness of diagnosis, but also not to operate rashly, for there can be no doubt that we are morally bound to consider the life of monsters as scrupulously as that of the fœtus in normal pregnancy.

Shortness of the umbilical cord is generally mentioned in systematic works as a possible mechanical hindrance to delivery. It is certain, however, that such an occurrence is extremely rare. We do not mean to assert that the cord is not occasionally short, but merely that this effect of shortness is not one which is likely often to take place. Cases do, it must be confessed, occasionally occur, in which the actual length of the funis does not exceed two or three inches, a condition which, if the placenta is normally situated, must imply delay in delivery, rupture of the cord, premature separation of the placenta, or inversion of the uterus. Some have denied that any impediment whatever is in this way likely to occur; but the evidence which has been advanced in favor of the contrary view seems pretty clearly to show that in cases of protracted labor, which have only terminated after rupture of the cord, the probable cause of the delay must have been the extreme shortness of the link which bound the fœtus to its utero-placental attachment.

What is certainly of more frequent occurrence than actual shortness of the cord is—what has mechanically precisely the same effect—coiling of the cord round the child. In such cases there is usually not only no shortening of the cord, but an undue length of it, which is the original cause of the coiling which takes place round the neck more frequently than round any other part of the fœtus. This artificial shortening is, we believe, of more frequent occurrence than is usually supposed; and every practitioner knows that few things are more common in practice than to find one, two, or more coils of the funis round the neck of the child. The exact stage of delivery at which arrestment from this cause is most likely to occur depends upon the length, or the length exclusive of coils, of the cord; but as a rule it would appear that it is seldom that much inconvenience is complained of until the stage of expulsion approaches, when, for the first time, the cord is put upon the stretch, and pain is, probably, to some extent, complained of in the region of the uterus. It has been stated, as a symptom during labor of shortness of the cord, that if the placenta is attached at its usual site, a depression of the fundus occurs at every pain, the rounded form being restored in the interval. That such an occurrence may take place, it would be impossible to deny; but it seems to us pretty clear that this is one of the instances, of which illustrations are too frequent in medical literature, where what we may call a theoretical symptom is set down as a real or practical one.

It has frequently been observed, when the cord was coiled round the neck of the child, that progress was for the first time arrested during or after the birth of the head. This has probably, to some extent, led to the routine practice of disengaging the coils as soon as their presence is detected, although the main cause undoubtedly is a dread of suffocation of the child by pressure on the respiratory passages. It has in some instances been found necessary, when the cause of the obstruction was evident, to cut the cord, a course of procedure which must recommend itself to the operator when the nature of the case is obvious. Caution should of course be exercised to prevent hemorrhage from the cut vessels by placing a ligature speedily on the umbilical side of the section; but it has been pointed out that a slight discharge is rather favorable in its effect than otherwise when asphyxia is threatened—a condition which may very probably be found to exist, along with the semi-apoplectic condition depending upon interruption to the circulation in the great vessels of the neck. In breech presentation, or after the performance of podalic version, the cord sometimes is found surrounding the trunk or entangled among the limbs, whence it will be proper to disengage it if possible; and if this cannot be effected, to cut it, rather than run the risk of obstruction in what, for the child at least, is always a critical labor. After such cases it is proper to introduce the hand into the vagina to ascertain that there is no inversion of the uterus, unless the state of the organ, as observed through the abdominal walls, is in all respects satisfactory.

A rare and curious cause of obstructed labor has been shown by Sir James Simpson to arise from dorsal displacement of the arm. This may occur either in pelvic or cephalic presentations. In the former case, which is more frequent, it is probably due, as Barnes shows, to an improper and imprudent dragging upon the limbs, the tendency of which is, as has formerly been shown, to allow the arm to pass up along side of the head. If one or other arm should, in this process, get behind the head—as is still more likely to occur in unskilful turning—it is not difficult to understand how the arm may get behind the neck and beneath the occiput, and thus constitute an impediment of a very serious character, the limb being so placed that its reposition is a matter of no inconsiderable difficulty. The arm will, in such cases, generally lie against the symphysis pubis, and it will therefore only be practicable to dislodge it, if we can succeed in pushing the parts upwards, so as to leave sufficient room, between the occiput and the upper part of the symphysis, to admit of such manipulation as may effect our object. In Simpson's case, the presentation was one of the head, in which the arm had in some peculiar way which it is difficult to understand got on to the nape of the neck, and was thrown transversely across the pelvis. The course suggested by him for the management of such cases is to bring the arm down by the side of the head, as its complete reposition above the brim would probably be impossible, and allow labor to go on in this way, the presentation now being an ordinary head and arm case; but we are impressed with the idea that the mode of procedure adopted by Dr. Jardine Murray in similar circumstances, which simply consisted in turning, meets much more fully the difficulties of the case.

There is but one other condition arising from the state of the ovum to which we think it necessary here to refer. This is unusual thickness and resistance of the membranes, which, sometimes, while things are otherwise going on favorably under efficient uterine contraction, absolutely stops the progress of the labor. It is needless to recapitulate what has already been said as to the management of the membranes; the only important point being that, before we decide on rupturing them, which will at once bring the difficulty to an end, we should be sure that the proper function of the membranes has been effected in producing dilatation of the os. No danger will accrue to the child, so long as the presence of the liquor amnii protects it from injurious pressure.

CHAPTER XXXVII.

UTERINE INERTIA AND PRECIPITATE LABOR.

IRREGULARITIES IN THE PROGRESS OF LABOR; OFTEN DUE TO INTESTINAL DERANGEMENT—INERTIA: INFLUENCE OF TEMPERAMENT, CLIMATE, AGE, EMOTION, EXCESSIVE DISTENSION, PREMATURE RUPTURE OF THE MEMBRANES, ETC.—INFLUENCE OF IRREGULAR UTERINE ACTION: UTERINE TETANUS—WIGAND'S CLASSIFICATION: DIFFERENT GRADES AND VARIETIES OF INERTIA—TREATMENT OF INERTIA; IF FROM OVERDISTENSION OR DISPLACEMENT OF THE UTERUS; IF FROM INTESTINAL DERANGEMENT—VARIOUS MODES OF EXCITING REFLEX UTERINE ENERGY—STIMULANTS AS A RULE TO BE AVOIDED—USE OF THE FORCEPS IN INERTIA—ERGOT; ITS NATURAL HISTORY, AND PHYSIOLOGICAL EFFECTS; RULES FOR ITS USE IN MIDWIFERY—OTHER OXYTOXIC AGENTS—PRECIPITATE LABOR; CAUSES OBSCURE: APPARENT CONNECTION WITH MENSTRUAL EXCITEMENT—LABOR MAY BE PRECIPITATE FROM DEFICIENT RESISTANCE—DANGER OF RUPTURE AND LACERATION OF THE UTERUS—TENDENCY TO POST-PARTUM HEMORRHAGE—TREATMENT: EMPTY BOWELS: OPIUM: SOURCES OF REFLEX IRRITATION TO BE CAREFULLY AVOIDED.

In no two cases of labor is the course of the process precisely similar, although the vast majority are from first to last perfectly normal. Nothing is more familiar to the accoucheur than the sudden and unlooked for changes which occur in the course of an ordinary case. In one instance, the tardy and inefficient progress which has characterized it during many tedious hours gives place, without any very obvious reason, to efficient and even violent action, which brings the act to a precipitate termination; while, in another, the safe and steady progress which has led us confidently to anticipate a speedy issue of the case, is provokingly interrupted by a failure of expulsive power, and that too, not unfrequently, when the second stage of labor is nearly at an end. Such occurrences as these are generally of no great importance, and resolve themselves most frequently into a trial of patience, or a moment of hurry and excitement; but cases do now and again occur, in which a failure of action or violence of propulsive force demands prompt and energetic treatment.

It has very frequently been observed that, in these matters, much depends upon the temperament and constitution of the mother; so that, in members of the same family, in persons of similar temperament or constitutional power, and to some extent in those of similar social position, there will often be observed a certain resemblance in the character and progress of the labor. In some cases, in which the balance between power and resistance is in any way disturbed, it would almost appear as if nature availed herself of some special compensating condition which the exigencies of the case had called into play. The woman, for example, whose health has been impaired by chronic disease or in whom the constitutional vigor and tone is naturally feeble, has as a rule comparatively weak uterine action, and always deficient voluntary force; but yet the labor runs a normal course, for the want of tone in nerve and fibre favors relaxation of the parts, and thus, proportionately and in a compensatory manner, diminishes the resistance. In women, moreover, of this temperament, the anatomical peculiarities of the sex are generally well marked, and the ample and shallow pelvis thus offers a comparatively trifling resistance to the passage of the child. If, however, we contrast with this the tall, vigorous, and muscular woman, we find that in the latter there is a very general tendency to the male type of pelvis, involving a tardy passage of the child through the pelvic canal. May we not infer that it is in some degree in compensation for this that she is furnished with muscles so powerful and constitutional vigor so marked, to enable her to overcome the greater resistance which in a feebler frame would constitute an insurmountable barrier?

There are many morbid conditions which exercise an influence more or less marked on the progress of parturition, to which we have had occasion more particularly to refer. We may here mention one cause, in regard to which no doubt can possibly be entertained, as leading both to tardy and precipitate action on the part of the expelling powers. This is the condition of the intestinal canal, any irritation of which may not only excite powerful reflex contraction, but may cause irregular uterine action, and in other cases may arrest it altogether; this being one of many reasons why tardy and precipitate labors are always considered together. An attentive observation, from a physiological point of view, of the phenomena which accompany parturition, and more particularly of the nervi-motor action of the uterus, will suffice clearly to show that there are many different ways whereby the forces upon which the act of birth depends may be disturbed or thrown out of gear, with the result, in one class of cases, of a labor which is too rapid to be safe, and, in another, of an arrest in the process which may prove a source of danger to the mother as well as to the child. It is, indeed, upon a correct appreciation of the physiological phenomena referred to that a sound and judicious treatment can alone be based.

Inert Labor.—It will be inferred from what has just been said that, in some constitutions, there is a natural tendency to tedious labor by reason of a deficiency in the expelling power. Within certain reasonable limits, this calls for no treatment, and is attended with no risk; but when these limits are exceeded, the case is to be considered as abnormal. Besides general debility, from whatever cause arising, there are other conditions which have been observed to increase the liability to inefficient uterine and expulsive action. Thus, climate and season exercise an influence which, although far from uniform, is sometimes obvious, the relaxing effect of a high temperature, in those instances, enfeebling the nervous and muscular tone; and it has even been stated that the result of long residence in the tropics has a permanently enervating effect, which may be manifested subsequently in temperate latitudes. Another cause is sometimes found to exist in the age of the woman, and in cases of precocious pregnancy this is occasionally very distinct. In women, again, who become pregnant for the first time in advanced life, it is well known that labor, as a rule, is tardy; and, although the idea usually entertained is that this is due mainly to increased anatomical resistance, there can be no doubt that, in a certain proportion of cases, it depends upon deficient force.

In those who have borne many children in rapid succession, the action of the uterus is often found to become enfeebled towards the close of the childbearing epoch, probably because the organ has not had sufficient time for rest, and for the gradual development of those structural changes which succeed delivery, during and after the period of involution. The influence of emotional causes, although marked, is generally temporary; as is often seen on the arrival of the accoucheur, when it arises from fear. Any sudden alarm, startling intelligence, or anything which may give rise to sudden emotion, may produce precisely the same effect; and, although, as a rule, the uterus in such cases will, after an uncertain interval, resume its function, it occasionally happens that the pause is so long, or occurs at such a critical period in the labor, that it is necessary to have recourse to art to expedite or complete the delivery. The various displacements of the uterus, which act by altering the axis of expulsion, are often considered under this head; but that, which is a purely mechanical cause of delay, has already been referred to in a previous chapter. What is here implied by inert labor, has reference, almost exclusively, to a faulty condition of the expulsive forces, in which they are abnormally feeble and inefficient; and this feebleness of contraction may either exist throughout the whole period of labor, or may come on, more or less abruptly, in the course of a case which had, up to that time, progressed in a manner leaving nothing to be desired.

The Causes upon which a failure of uterine action depends embrace, in addition to those above mentioned, certain conditions of the parts, more or less strictly morbid. To these attention must be given, as it is manifest that a mere routine treatment, adopted without an intelligent reference to the circumstances of the case, must necessarily often fail of its object, and may sometimes only tend to make matters worse. Excessive distension of the uterus, by thinning the walls of the organ beyond ordinary limits, is one of the conditions to which we refer. The effect of dropsy of the amnion, for example, may in this way interfere with the due action of the organ; and, in such a case, less good will be derived from the exhibition of agents which excite the uterus to contract than from rupturing the membranes, and thus allowing the uterine wall to come into contact with the surface of the child, when it will in all probability be roused to active energy.

The death of the child was believed by Baudelocque to weaken materially the uterine contractions; but Dubois asserts, and modern accoucheurs generally agree with him, that when the woman is in good health, the death of the child exercises no influence whatever, in the way of enfeebling uterine action, and that if it sometimes happens that labor goes on more slowly when the child has ceased to live, this is to be accounted for by the fact that the death of the child is probably the result of some disease of which the mother has been the subject, and that, consequently, her forces have been already weakened. The premature rupture of the membranes, and consequent discharge of the waters, very generally causes a tardy labor, but this operates chiefly in the first stage, and is mainly due to want of the mechanical dilating power of the bag of the membranes. Inefficient uterine action has often been observed to be associated with undoubted morbid conditions of the organ. Among these may be mentioned rheumatism, gout, and neuralgia; and, in addition, congestion and inflammation of the uterus. In so far as congestion and inflammation are concerned, while their occasional existence cannot be disputed, there can, we imagine, be little doubt that the older writers greatly exaggerated their importance and frequency, as an excuse for the never-failing remedy of the lancet. A morbid condition, however, of the uterine fibre, depending upon some form of uterine inflammation, is a possible, and we would venture to say a probable, cause of some of the most complete cases of uterine inertia.

A distended bladder or rectum may, in addition to the mechanical impediment which it constitutes, act injuriously in arresting uterine action; and it has been observed, in those cases in which pressure on the sacral nerves causes cramps in the lower limbs, and the excessive agony to which these give rise, that the effect on the uterus is to weaken, and not to increase its action. Several cases of this kind are cited by Meigs.

Another effect which is occasionally produced is irregular action, in which the whole of the organ is not symmetrically contracted. Irregular contractions, as we have already seen, give rise to retention of the placenta, hour-glass contraction, and inversion of the uterus; and, in like manner, they necessarily occasion pains which are inefficient, inasmuch as they do not act upon the whole circumference of the ovum. In such cases, the pains are more irregular in their occurrence, and the suffering, which is severe, is referred at one time to one part of the uterus, and again to another. Sometimes, the hand placed over the abdomen can detect inequality on the surface of the contracting organ, showing what parts are in action and what parts are paralyzed. Under the influence of contractions such as these, labor makes little or no progress, the bag of membranes does not project in the usual way during a pain; or, if the second stage has been reached, the presenting part of the child makes no advance. The woman now becomes exhausted, the pulse frequent, and the case may assume a grave aspect. It is to the more serious forms of this that the name of "uterine tetanus" has been given.

Inefficient uterine action being thus found to depend upon such a variety of causes, it is not to be wondered at that attempts have been made to classify the cases. Wigand proposed to divide all into three groups. In the first, the womb contracts, not only quite regularly, but even to such an extent that the child is bent forwards at each pain, and the labor has in general an otherwise normal course; but this course is very tedious, and the pains are interrupted by too long intervals. This he calls *Inertia Uteri*. In the second grade, which he describes as *Adynamia* or *Atonia Uteri*, the uterus also contracts in a manner which is, so far, quite regular; but the contraction is incomplete, of short duration, and inefficient, and lasts longer at the fundus than in the lower segment of the organ. In the third grade, all pain in the uterus has ceased, so that, beyond a certain feeble tension, no trace of contraction is to be observed: this condition Wigand describes as *Lassitudo, Exhaustio,* or *Paralysis Uteri.* Scanzoni proposes that we should draw a distinction only between "primary" and "secondary" inefficient action, including, under the first term, all cases in which, from first to last, the womb lacks sufficient energy to complete the labor without assistance; and, under the second, those cases in which the contractions were originally sufficient, but have failed in the course of labor, so that, in the end, all the symptoms of primary inertia are manifested.

We doubt much whether any such system of classification is of value, either as a guide to practice or in elucidating the subject; and we therefore prefer, as embracing all cases of failure of uterine action, the simple term Inertia, which is generally used in this sense by English writers. Obviously, however, this may exist in any grade, from mere feebleness of contraction to absolute paralysis of the uterus. It is proper, in considering this subject, not to overlook the possibility of failure in the auxiliary expulsive forces; for it must be obvious that, in the course of the second stage, anything which may prevent the efficient action of the expiratory muscles must of necessity interfere, more or less, with the act of parturition. Acute or chronic pulmonary disease, therefore, as well as cardiac or hepatic disorders, and the ascites which often accompanies them, may, with other abnormal conditions, so interfere with the dynamical phenomena of parturition as very seriously to obstruct the progress of labor.

Treatment.—A careful consideration of the circumstances above mentioned, as applicable to individual instances, will always be our best guide to the treatment of those cases in which there is a failure of the *vis a tergo.* An error in the axis of expulsion, which is usually dependent on anteversion of the gravid uterus, and therefore does not strictly fall under our notice here, may be managed without difficulty, under ordinary circumstances, by postural treatment or by the abdominal bandage, so as to bring the axis of the uterus, as nearly as may be possible, into coincidence with that of the pelvic brim. Overdistension of the uterine cavity, by reason of dropsy of the amnion, plural pregnancy, or any other cause, should, if symptoms of inertia develop themselves, be treated by rupture of the membranes, and that for reasons which have already been stated.

Although, perhaps, rheumatism of the uterus has been somewhat exaggerated, as regards its importance as a cause of retarded labor, the symptoms should always be taken into consideration, as they are such as may divert our attention from the inefficiency of the labor. These symptoms have been well described by the younger Naegele. "Rheumatism of the uterus," he says, "is recognized by the following signs: During labor, and often before it, the uterus is unusually sensitive to contact, both from without and from within. The pains are feeble, short, infrequent, and unusually painful, and, in fact, excite as much pain at their commencement as normal pains do at the height of the contraction. During the interval between the contractions, the pain does not cease. The woman complains of heat, great thirst, and uneasiness; the pulse is rapid, small, and hard. In the course of labor, the suffering from the pains increases, in proportion as their efficiency diminishes. In favorable cases the pains cease for a time, the patient falls asleep, after which regular pains soon recur, and continue until the completion of the labor; but when the case is mistaken or unskilfully treated, the labor becomes extremely protracted, debility and cramp come on, and rheumatism passes into metritis."

In a large proportion of cases, as we have seen, the cause of the failure of uterine action is to be found in the condition of the alimentary canal; and on that account one of the first points that we should attend to in all cases is the condition of the *primæ viæ;* and in like manner, and for similar reasons, it is advisable to ascertain the condition of the bladder, which sometimes exercises a scarcely less important influence on the progress of the case. The effect of relieving a distended or irritated viscus is often so striking that a very common and frequently efficient mode of treatment, in cases of uterine inertia, is to throw an enema of a stimulating character into the rectum; and, in fact, so susceptible is the uterus, even in these cases, to reflex irritation, that a simple enema of warm water will often suffice to awaken its dormant energy.

The action of the organ may also be roused by other expedients of a still more simple character. A warm diluent drink is often found to have an effect as marked as an enema, and when the strength has become in any way exhausted, it will be proper to substitute for this strong soup, or even some form of stimulant. The accoucheur can scarcely, however, be too cautious in sanctioning the use of stimulants in labor. Among the lower classes in Scotland—where whisky is the panacea for all evil—it will often be impossible to prevent its administration; but the universal opinion of all who have witnessed the indiscriminate administration of stimulants in labor is that the effect, as a rule, is to retard and not to advance the period of delivery. The reflex activity of the uterus is often aroused by digital examinations, which seem to excite the nerves of the cervix, or those which are distributed, in some abundance, to the tissues of the perineum. Free examination of those parts, therefore, which, under ordinary circumstances, is to be condemned, may here be practiced without hesitation, should the uterus show any symptoms of response—a result which will be further encouraged by friction over the surface of the abdomen.

The position of the woman often exercises, at all stages of labor, a very decided effect on the vigor and efficiency of the pains; and in a woman in whom there is an evident tendency, on the part of the uterus, to flag in its efforts, the erect posture, by permitting the child to gravitate towards the lower segment, has generally a most beneficial effect; so that it is often proper in those cases to cause the woman to walk about the room, even at an advanced stage of labor, in the hope that this result may ensue. An abdominal bandage, properly applied, will frequently be found to contribute much, both to the comfort of the woman and the efficiency of the pains, on account of the pressure which is thus exercised upon the uterine walls, and the increased efficiency with which the abdominal muscles are enabled to act. When a tendency to inertia exists, something will usually be effected by carefully watching the course of the labor, encouraging the woman to husband her efforts in the first stage, and urging her to make full use, during the second stage, of the expiratory muscles, by closing the glottis, fixing the limbs, and abstaining from crying during the presence of a pain.

In a certain number of cases, however, the uterus sinks into a state of complete inertia; or the pains become so feeble that it is evident that labor cannot be completed by the unaided powers of nature. This condition is one which is often attended with no inconsiderable amount of risk, both to mother and child. If the failure should occur in the early stage of labor, before dilatation of the os has been effected, and the head has descended into the pelvis, we may place more confidence in nature, and may wait for a reasonable time, in the hope that more efficient action may be set up; or we may employ the more simple means, which have been detailed, with the view of stimulating the uterine fibres to contract. When the os is fully dilated, or even, as we have seen at an earlier stage, when we have reason to believe that there is dropsy of the amnion, rupture of the membranes is a perfectly proper and justifiable procedure, and will often be followed, after a brief interval, by vigorous contraction. Should this fail, or should the inertia have become developed in the course of the second stage, we have then to choose between the forceps or some other mode of operative delivery, and the oxytoxic agents, of which the ergot of rye is by far the most important.

When the head is low, and the conditions otherwise are such as to render the operation both easy and safe, the forceps should, in most instances, be preferred; and, in all cases in which the circumstances are such as to call for a speedy delivery, we should have recourse to this operation, or to turning. But, when the head is high in the pelvis, and there is no obvious necessity for rapid delivery, we may resort to some of the agents referred to.

Ergot, which is, as we have said, the most important of the class of drugs to which we refer, is to the accoucheur an agent so important and so powerful, that we may here interpolate a brief account of it, and of the rules which should guide us in its employment in the exigencies of ordinary practice. "The Ergot, or Spur," says Christison, "seems to affect occasionally all the Graminaceæ, more rarely the Cyperaceæ, and sometimes even the Palms. No plant, however, presents it so frequently, or of such size, as common rye,—the *Secale Cereale*. It is generally thought to arise under the influence of undue moisture; and although this condition seems not to be absolutely essential, it is never produced with such certainty as in wet seasons, and in districts where the soil is damp, rain frequent, and the atmosphere still and misty, especially at the time the grain is coming into flower. In these circumstances, it is produced, according to some, by punctures made by insects in the glumes, while the substance of the seed is pulpy; others conceive that it is caused by the spawn, or sporidia, of a peculiar species of fungus." The Ergot of Rye is an irregularly cylindrical body, averaging about an inch in length, and slightly curved, like the spur of a cock,—hence the name "Spurred Rye." It has a very powerful toxic action, and gives rise, when taken in large quantity, or for a considerable time, to two classes of symptoms,—convulsive and gangrenous. It produces, as has been demonstrated by Dr. Brown-Séquard, an influence on the vaso-motor nerves, and thus causes contraction of the vessels of the spinal cord, on which account it is frequently used in congestive and inflammatory affections of that structure. There can be no doubt that it is through that channel that its specific action on the uterus is produced; and it undoubtedly is the most certain in its action of all the agents hitherto discovered in promoting the contraction of the muscular fibres.

Its action may always be counted upon with more certainty when the uterus is fully developed; so that, in abortion, it cannot be depended upon as likely to promote the expulsion of the ovum, with anything approaching to the certainty with which, towards the end of pregnancy, the uterus responds to its action. Still, although thus comparatively inefficient, there are no circumstances under which its action on the uterus may not be manifested; so that we not only find it sometimes to act with unexpected vigor in the expulsion of an early embrybo, but even in the unimpregnated organ in the treatment of menorrhagia; and it has occurred to us more than once to be able to demonstrate the uterine nature of a doubtful abdominal tumor by the contractions produced in it by the action of several doses of ergot. It is, however, when labor has actually commenced that the action of ergot is most marked; but there can be no doubt that, under other circumstances, it operates, although with less certainty, in inducing abortion or premature labor, or otherwise initiating uterine action.

The physiological effects of the drug are, of course, of great interest to the accoucheur. We may here pass over, as foreign to our subject, its more important toxic effects; but we may note that it has frequently been observed to produce nausea and vomiting, which, of course, may absolutely prevent the possibility of its action. In such cases, it has been given in the form of enema with perfect success. The usual effect on the circulation is a diminution both in the frequency and fulness of the pulse, sometimes accompanied with faintness and pallor. In some instances, symptoms of cerebral disorder manifest themselves in the form of weight and pain in the head, giddiness, delirium, dilatation of the pupil, and stupor; but these symptoms commonly follow the uterine contractions, and are usually observed in those cases in which an unnecessarily large quantity of the drug has been administered. That such symptoms may be manifested is enough to show, that ergot is always to be used with some caution.

Its action on the uterus, with which we have more particularly to do, is generally observed in from ten to fifteen minutes after the medicine has been taken, and is indicated by an increase in the violence and duration of the pains. When the full effect of the drug has been produced, the pains are quite different from those of normal labor, inasmuch as they are absolutely continuous, or are, at least, without any proper interval, although there may be regular periods of remission. This uninterrupted contraction of the uterine tissue necessarily involves a certain interference with the utero-placental circulation, over and above what occurs in the rhythmical contraction of ordinary labor; and it must be admitted that the absence of the natural periods of uterine rest may, if long-continued, place the life of the child in peculiar jeopardy. This, however, has, we believe, been greatly exaggerated. "The ergot," says Dr. Hosack, "has been called, in some of the books, from its effects in hastening labor, the *pulvis ad partum;* as it regards the child, it may, with almost equal truth, be denominated the *pulvis ad mortem:* for I believe its operation, when sufficient to expel the child, in cases where nature is alone unequal to the task, is to produce so violent a contraction of the womb, and consequent convolution and compression of the uterine vessels, as very much to impede, if not totally to interrupt, the circulation between the mother and child." This assertion has been satisfactorily refuted by Chapman, Dewees, and others; but still we are inclined to think there is some grain of truth in it—at least in those cases in which labor is protracted in spite of strong and unceasing pains. Dr. F. H. Ramsbotham supposed that the toxic action of the drug might be extended from the mother to the fœtus, and the figures which he gives would seem to go some way to prove his assertion. Of 36 cases in which he induced premature labor by puncturing the membranes, 21 children were born alive; while, in 26 cases in which labor was induced by ergot alone, 12 children only were born alive. Apart from the fact that such statistics are open to many fallacies, we repeat our conviction that the danger of ergot to the child has been greatly exaggerated; and we believe that the unsatisfactory results which have been reported have been mainly due to the rash administration of the drug, without any reference to the conditions upon which alone we can rely for a satisfactory result.

The violence of the contractions produced by ergot is such that we are never safe in administering it, unless we are convinced that the anatomical conditions are such as to admit of the passage of the child without extreme or unusual resistance. To give ergot, therefore, in a case of shoulder presentation or of deformed pelvis, when the os is undilated, or when the soft parts generally are rigid, dry, and undilatable, is manifestly wrong; and, in the first two cases, would amount to malpraxis in the worst form. As regards the condition of the os, the rule is as stated, but is not so absolute. If it were so, it would debar us from making use of ergot in the induction of premature labor, where its action initiates the commencement of the first stage. Nor, as regards ordinary cases, are we to admit that we must always wait until the os has become dilated; for there are instances, in which a dilatable state of the os, with a properly lubricated condition of the passages, would be quite sufficient warrant, in the absence of all action, for the administration of ergot. If labor should become arrested before the os has opened to some extent, there can be no question of medicinal treatment, as there is no risk either to mother or child in the arrest of a labor which has as yet barely begun. When the head is low in the pelvis, the forceps, as already remarked, will usually be preferred; and, if any delay should arise after the exhibition of ergot, the head being well in the pelvis, it may be proper to complete the delivery by instrumental aid. Indeed, we believe that the number of cases in which the two may with propriety be combined is larger than is generally believed. The objection to the forceps, in the case of an absolutely inert uterus, is that we may empty the organ, which then, contracting imperfectly, admits of alarming or fatal hemorrhage; but, if we combine the two, the one force will not only aid the other, but the ergot will insure safety after delivery by maintaining the womb in a proper state of tonic contraction. If the contractions are violent, speedy delivery is always to be desired, as a considerable number of cases of rupture of the uterus are on record from the use of ergot alone.

The mode in which ergot is usually administered is in the form of infusion. Two drachms of fresh ergot coarsely crushed may be infused for twenty minutes in six ounces of boiling water; one-fourth of the infusion to be given at intervals of ten or fifteen minutes until distinct uterine action is manifested. If, with the second or third dose, the desired effect is already produced, it is wrong to proceed further, for the result of more than is necessary will only be to increase the tetanic character of the contractions and the risk both to mother and child. If the quantity above mentioned has been given in four doses without any response on the part of the uterus, it will be needless, and indeed improper, to pursue the treatment further; and cases do, not unfrequently, occur in which the drug seems to be absolutely inert. The infusion should always be freshly made; but the great objection to it is that one cannot be sure of the quality of the ergot, more especially if it has been kept for any time, when it is apt to become mouldy, or to be entirely destroyed by an acarus, which feeds upon it and leaves the grain as a mere shell. All these difficulties are got rid of by the use of the Liquid Extract of the British Pharmacopœia, which may be given in doses of twenty minims for three or four times and at the same intervals as the infusion. Schacht's "Liquor Secalis" and the pharmacopœial Tincture both contain the active principle of the drug and may be given in drachm doses; but the liquid extract is the preparation which we can with the greatest confidence recommend, as we have had more experience in its use.

Ergot was used by women for hurrying labor long before it was known to the profession; and the same remark may be made of Borax, which was used by the ancients, and has been employed quite recently in Germany by some in preference to ergot, being supposed to be free from the objections which attach to ergot as a toxic agent. Cinnamon and Strychnia have also been employed, as well as numerous other drugs; and a very thorough trial has been made of galvanism, which, although it has an undoubted effect upon the uterine fibre, is certainly less to be depended upon than ergot, and has therefore fallen entirely into disuse.

It has often been stated that the various agents of this class should not be made use of in the case of primiparæ; but to the judicious practitioner such a rule is quite unnecessary, as he will not fail to take into consideration the greater resistance which naturally obtains in the case of a first labor. There is, in fact, if he does not lose sight of the special conditions referred to, no reason why he should not avail himself of the action of the oxytoxic agents in primiparæ as well as in pluriparæ. For the guidance of the inexperienced practitioner, we will add one caution only—that he should not be too eager in his endeavors to bring a case to a speedy termination; for it often happens that a sudden cessation of the uterine efforts is merely an indication that the organ is collecting itself for more vigorous action and a final effort.

Precipitate Labor.—Although of less frequent occurrence than failure of the expulsive force, the accidents which may accrue in labors which are too rapid are scarcely less serious. In the great majority of all such cases, there is some peculiarity of constitution or temperament. It has, indeed, not unfrequently been observed in the same patient in successive pregnancies, and even in different members of the same family. It would also appear to be occasionally connected with a morbid irritability of the generative system, which may have been previously manifested in undue excitement at the menstrual periods. In some extreme instances, the action, from the very commencement of labor, is so severe that the patient is compelled to bear down from the first. The appearance and expression of the countenance, and the state of the pulse, denote a condition of excitement and suffering which is quite abnormal; and, in such instances, we may with some reason dread the occurrence of uterine rupture at a stage when we are comparatively powerless to avert it. The pains are almost continuous; and, if the parts are relaxed, the child may be forced through the passage with a rapidity which is almost appalling. In such instances, indeed, when the woman is taken unawares, the child may be born while she is yet in the erect posture, and dashed upon the floor.

Although, as we have seen, the usual effect of premature rupture of the membranes is to retard labor, the contact of the uterine walls with the surface of the child has occasionally the effect of rousing the organ to action of the most violent and uncontrollable kind, although the parts may as yet be but imperfectly prepared for the stage of expulsion. Emotional causes of various kinds may also have a similar effect in producing contractions of such energy as to bring the labor to a termination with unexpected rapidity. In some cases, the operation of these causes is obviously beneficial, and the mere threat of operative interference, or the production of the forceps, will sometimes have the effect of rousing the flagging energy of the expulsive forces, and bringing matters to a termination before operative measures have been resorted to. Scarlatina and other acute febrile disorders have in some instances a precisely similar effect.

In another class of cases, the rapidity of the labor seems to be due less to the violence of the pains than to the deficiency of the resistance to the passage of the child through the parturient canal. In the case of a pelvis of unusual size, this may take place, even although the pains are in no way beyond the average; and, of course, if such an anatomical condition as this is combined with violent uterine action, the rapidity of the delivery may be such that only a few minutes intervene between the preliminary pains and the termination of labor. If the head is smaller or more yielding than usual, or the soft parts more than ordinarily dilatable, these conditions will also contribute to a similar result.

The dangers attendant upon precipitate labor are various. The extreme violence of the contraction may cause rupture of the uterus; or, the rapid passage of the child may cause laceration of the cervix, vagina, or perineum, and the more remote dangers to which these accidents give rise. In other cases, the uncontrollable violence of the expulsive action of the voluntary muscles (which in such a case become virtually involuntary) may force the air into the cellular tissue, and cause emphysema of the face and neck. The sudden emptying of the uterus may be followed by a period of complete relaxation, so that all such cases are known to be peculiarly liable to post-partum hemorrhage. Rupture of the membranes only makes matters worse, and the direct pressure to which, in such cases, the child is subjected, exposes it also to no inconsiderable risk.

Another danger to the child arises from the risk of delivery taking place when the woman is in the erect posture, where it may be seriously injured by being dashed upon the floor. The rupture of the cord, which would probably occur under such circumstances, is not, as some have supposed, an important source of danger, seeing that the fact of laceration of the vessels, which must take place, is an effectual barrier to hemorrhage. It has been observed, in cases in which the resistance was much less than the expulsive force, that the uterus, in its undilated condition, has been forced down upon the perineum, and has even protruded externally before the os had sufficiently yielded to permit of the passage of the child.

The Treatment of precipitate labor consists in adopting such measures as are available for moderating the violence of the uterine action. As a considerable number of cases are associated with some intestinal derangement, it is proper, in the first instance, to wash out the bowels by a simple injection of tepid water, the soothing effect of which will sometimes become at once apparent. But if, as is more likely, the turbulence of the uterine action still continues, nothing is so likely to produce a decided effect as opium, given in the form of a suppository of one of the salts of morphia. This is better than the exhibition of any of the preparations of the drug by the mouth, more especially if there is a tendency to irritability of the stomach. The other sedatives have a similar, although less certain, effect; and, in many cases, the result of chloroform inhalation is wonderfully to moderate the uterine action.

A knowledge of the physiology of the expulsive forces will instinctively guide us to such management of the case as may obviate, as far as possible, any voluntary action. Everything, therefore, which the woman might seize, or anything against which she could press her feet, should be carefully removed, while the action of the pain should be watched, and the woman encouraged to cry out lustily rather than to fix the glottis. Such modes of treatment as we have shown to be useful in inertia, should here be scrupulously avoided, and a directly contrary plan adopted. We should carefully avoid, therefore, digital examinations, beyond what may be considered absolutely necessary, and protect the patient from all sources of mental emotion or physical excitement, and from any other cause which experience has shown to exercise a decided influence upon the uterine fibre. On no account should the woman be allowed to assume or maintain the erect posture, which is well known to act as a fresh incentive to uterine action, by allowing the child to gravitate downwards and press against the os and cervix. Although, theoretically, we might naturally suppose that the ordinary abdominal bandage would rather encourage than abate uterine action, it has been found that it sometimes has a soothing effect, adding to the comfort of the patient, and in some degree relieving her suffering. Should this expedient be tried, it will be well so to adjust the bandage as to support the womb by pressure applied chiefly between the lumbar and hypogastric regions. When procidentia is threatened, it may be necessary to support the uterus by means of a bandage applied externally, and so adjusted as to press against the vulva. When the lower segment actually protrudes, a hole should be made in the bandage so as to aid the longitudinal fibres of the uterus in mechanically overcoming the resistance of the circular fibres and tissues of the os. In this way Naegele has operated successfully, allowing the child to be born actually through the aperture in the supporting bandage.

In cases of violent and precipitate labor, the fearful exertion to which the patient is impelled may culminate in an epileptic seizure, or even in apoplexy. In some cases the suffering is so great and so continuous, and the woman is worked up into such a state of frenzied excitement that, at the moment of delivery, she is actually unconscious of what she does. It is in consideration of this that the Continental codes look with leniency upon child murder perpetrated under such circumstances; and, probably, even in our own country, if such facts were substantiated, the law would take a similarly lenient view, although it is not set forth in the statute-book. Another question in medical jurisprudence, and which may have an important bearing in cases of suspected infanticide, is the likelihood of the mere rapidity of the birth being the cause of death of the child, as cases are recorded in which children have been born while the woman was in the erect posture, or even when she was at stool. It would appear, also, that sometimes, owing possibly to the great cerebral excitement, there is a greater tendency to the occurrence of puerperal mania, in women in whom the symptoms during labor have been of the nature of those above described.

CHAPTER XXXVIII.

THE PUERPERAL STATE: LACTATION.

MANAGEMENT OF THE PUERPERAL STATE—THE LOCHIA: NATURE AND SOURCE OF—AFTER-PAINS: TREATMENT OF—THE LACTEAL SECRETION: MILK FEVER: COLOSTRUM—THE CHILD TO BE PUT TO THE BREAST AT FIXED INTERVALS—AGALACTIA—GALACTORRHŒA: TWO VARIETIES OF—MANAGEMENT OF LACTATION—EFFECTS OF OVERFEEDING—DURATION OF LACTATION—EFFECTS OF MENSTRUATION AND PREGNANCY UPON LACTATION—DISORDERS OF LACTATION—INFLAMMATION AND ABSCESS OF THE MAMMA: EFFECTS OF: TREATMENT—EXCORIATION AND FISSURE OF THE NIPPLES: PREVENTION OF: TREATMENT OF.

THE management of labor, up to the stage when the accoucheur is able to leave his patient after her delivery, has already been described in a previous chapter. We now propose, however, to consider, somewhat more in detail, the treatment of the woman during the puerperal state,—while she is under the influence of conditions which, although strictly physiological, may very readily become morbid. The condition of the woman during the period immediately succeeding the termination of labor is one of delightful calm and repose, which offers a remarkable contrast to the excitement and frenzy of the concluding stage of the process. The falling of the pulse shows the subsidence of a turbulent circulation, and is due, in some degree, to a modified shock. When labor has been easy, and of moderate duration, there are no symptoms of shock; but in other cases, and in proportion to the violence and duration of the process, the patient shows symptoms, more or less distinct, of debility, and the shock to the nervous system manifests itself further by intolerance of light and sound and other symptoms of temporary exhaustion. Perfect quiet, and, above all things, refreshing sleep, will speedily rouse the woman from the condition into which she has fallen; and so important, indeed, is the latter point, that many experienced practitioners have been in the habit of giving an opiate, as a matter of routine, shortly after delivery. In ordinary cases, however, opium is unnecessary; but, whenever there is shock and marked exhaustion, a moderate dose of the Liq. Opii Sedativus may almost always be given with advantage.

The old method of treatment by starvation during the first few days,—when the diet was confined to tea, water-gruel, or arrowroot,—finds few, if any, supporters at the present time. Nothing, indeed, could be more irrational than such treatment, or more likely to retard recovery and discourage the lacteal secretion; so that it will be quite proper, after the first day at least, in the great majority of instances in which the patient has had some sleep, to give chicken soup, or beef tea, in addition to the dry toast, gruel, arrowroot, and sago, which are properly given at this stage, as being substances easy of digestion.

In the course of his subsequent visits, the accoucheur should see that the bandage is properly managed, and tightened from day to day; and it is well, by firm and equable pressure, exercised over the hypogastric region,—which has often the effect of dislodging clots,—to be assured of the satisfactory state of the uterus as regards contraction. One of the first points to which he addresses his inquiries is with reference to the function of the bladder, which is sometimes resumed with difficulty. Laving with warm water will usually be all that is required to excite the bladder to contraction; but, in some cases in which the labor has been difficult, the viscus is actually paralyzed, so as to require the use of the catheter, which may have to be repeated for several days.

If the bowels have been freely moved, as they should always be, shortly before delivery, we need pay no attention whatever to that function until forty-eight hours have elapsed. Torpor of the bowels is, after labor, an almost invariable condition, which is probably due, as Dr. Tyler Smith says, to "the exhaustion induced by labor in all the organs under the influence of the spinal cord." Under the ordinary conditions of the puerperal state, it is, therefore necessary to give some laxative medicine,—of which class of remedies castor oil is undoubtedly the best. Other laxatives may, no doubt, act with equal efficiency; but, as a rule, and especially in the form of pill, they are not to be depended upon. It is somewhat remarkable that, sluggish as the bowels are, they respond very readily to the action of laxatives, even in the case of those who are habitually costive. It will therefore rarely be found necessary to prescribe more than a dessertspoonful of castor oil, which may be given with lemon-juice early in the morning. On several occasions, we have seen an ordinary dose of half an ounce followed by such violent action as to require opiates to restrain the purging.

The Lochia.—While the placenta, during the third stage of labor, is being separated and expelled, a considerable amount of hemorrhage naturally takes place, and, after the completion of the process, blood continues to ooze from the ruptured and partially closed vessels on the inner surface of the womb. Efficient and rhythmical contraction of the uterus prevents the flow from becoming so profuse as to be dangerous; but still, a certain amount of discharge goes on for a time; and, indeed, it is well known that the maintenance of this discharge, for a certain time after delivery, is, to some extent, a guarantee of the favorable progress of the case, while, on the other hand, its premature arrestment is an almost invariable accompaniment of the more serious puerperal disorders, and is therefore always looked upon with more or less of apprehension. In order to understand the true nature of the lochial discharge, it is necessary to consider for a moment the anatomical condition of the parts from whence it springs.

That part of the uterus from which the placenta has been separated was compared by Harvey to the stump of a limb after amputation; but, although the simile has been frequently repeated, physiologists are well aware that it is only to a limited extent correct. The vessels, no doubt, are torn across in the course of the separation of the placenta, but, with this exception, there is no real breach of tissue, as nature has for many weeks been preparing for the process of separation. At birth, the inter-utero placental tissue divides into two layers, as was formerly explained, one of these remaining adherent to the uterine wall, along with portions of the decidua serotina. If the womb be examined shortly after delivery, that part of it to which the placenta was attached will be observed to be thicker than the other portions, and projecting somewhat into the cavity of the uterus. Upon this surface, which is rugged and unequal, small clots, projecting from the orifices of the closed vessels, and so contributing to their efficient closure, are observed, along with shreds of membrane; and, over the whole inner surface of the cavity of the organ, remains of the decidua vera or of the subjacent textures from which it has been stripped are clearly to be made out. The discharge, then, which constitutes the lochia is, in the first instance, composed of almost pure blood. After this, it is still sanguineous, but has been found by M. Robin to contain an unusually large proportion of white corpuscles. As the discharge changes in character, the proportion of white corpuscles becomes higher and higher, and these are believed by the same authority to have their origin directly in the inner surface of the uterus. After the second day, the white corpuscles increase in number, while the red globules diminish. The discharge gradually assumes a reddish-gray, and then a greenish or yellowish hue, at which period there are scarcely any red corpuscles to be found. The white corpuscles are, however, the predominating element, and some of them may now be observed to have become voluminous and full of fatty granules, having in fact assumed the characters which have gained for them the name of "granular globules." Along with these elements will be found fragmentary traces of the decidua, and also pavement-epithelium from the mucous membrane of the vagina.

The lochial discharge has a peculiar odor, sometimes offensive in character, but at no time, if it follows a normal course, is there a purulent discharge, nor is the process in any way analogous to the suppuration which accompanies the reparative process of a healing stump. While the remains of the decidua are thus being separated, the small clots which plug the vessels, or are adherent to the surface, undergo a process of disintegration, and are separated along with the other constituents of the lochia. The new mucous membrane, which, according to Robin, begins to form beneath the decidua as early as the fourth month, is distinct about the ninth day, when the columnar epithelial cells begin to be developed. The surface then becomes smooth, and the discharge becomes colorless and finally ceases, these changes going on *pari passu* with the process of fatty degeneration of the muscular fibres, which has been previously described.

Care should be taken by the nurse to promote, while avoiding unnecessary interference, the lochial discharge. A strict regard to cleanliness is the most important indication. The external parts are, with this view, to be sponged lightly with tepid water, and the napkins changed as often as may be necessary; and if the fetor is unusually great, it will be well to wash out the vagina by a warm-water injection containing a small quantity of carbolic acid. The discharge is also promoted by the acts of defecation and micturition, and by any change of posture; and it is a good practice, after the second day, and if nothing should occur to contraindicate such a procedure, to encourage the woman to make water on her knees, which permits of the escape of any portion of the fluid which may have become accumulated in the cavity of the vagina.

After-Pains are the natural accompaniments of the contractions which usually take place after labor, having for their object the expulsion of any clots that may be contained within the cavity of the uterus, and probably the expulsion of the clots which seal the vascular orifices. These after-pains are trifling or altogether absent in primiparæ, but are almost always present, in a greater or less degree, in women who have previously borne children. Up to a certain point they have a decidedly salutary effect, and contribute to the favorable progress of the case; but it not unfrequently happens, particularly in women who have had many children, that they are so severe as to cause much suffering and no little constitutional disturbance. Anything, in these cases, which tends to engender reflex uterine contraction will be pretty sure to aggravate the symptoms, so that vaginal examinations and irritation of the rectum and bladder should, as far as possible, be avoided or rectified. One of the most familiar causes of after-pains, so common as to have given rise to an aphorism among nurses, is the application of the child to the breast; and the accoucheur should generally avail himself of this well-known fact to insure thorough and efficient uterine contraction. And we may here repeat what was stated on a previous occasion, that nothing, perhaps, tends so much to insure that the after-pains shall be moderate in degree as gentle pressure on the fundus, and careful attention to the contraction of the uterus during and after the expulsion of the placenta.

The after-pains usually commence soon after labor, and in bad cases they last for three or four days. In other cases, again, they are at first moderate, and after some time come on with great violence. If there be any suspicion of retained coagula, it will be proper to pass the finger into the vagina, and remove any clots which may be within reach. Should no such cause be discernible, and the pains still persist, the application of a warm poultice over the hypogaster, or a soothing injection into the vagina, will often suffice to allay the suffering, if not to cause perfect relief. In France, an ointment containing belladonna has been extensively used, and no doubt may be productive of benefit; but the objections to the general use of this drug have already been stated. In some instances the pains are distinctly neuralgic, or are associated with a rheumatic condition of the uterus; and in these, as well as in all other cases in which the sufferings of the woman go beyond a certain point, and especially when they prevent sleep, opium may be given without hesitation, either by the mouth or by enema. It is well, however, before giving opium in any form, to be sure that there is no irritation of the bowel from overdistension or any other cause, as it will be proper to relieve that condition before having recourse to sedatives. Dr. Tyler Smith has found benefit occasionally to result from the application of an anodyne embrocation to the breasts. It must be clearly understood that after-pains, although due, in their usual form, to a physiological action, are, when severe, not to be neglected; for not only may the want of sleep and constitutional irritation lead to unpleasant results, but the case, if abandoned to nature, may even pass into inflammatory disease, which, at this particular epoch, is, as we shall see, peculiarly disastrous in its effects.

The Lacteal Secretion.—The enlargement of the breasts which is so characteristic a sign of pregnancy, is usually accompanied, not only with increased development of the mammary glands, but also, during the last few months of gestation, with a secretion of more or less milk. The quantity is, however, small, and although it may, in some cases, be pressed out in jets from the nipple, there is no accumulation of the fluid in the ampullæ of the galactoferous ducts. In most women, no marked alteration takes place until about the third day, when the secretion of the milk—properly so-called—commences. At this time, there often is what has been described as a rush of milk to the breasts. The glands become considerably enlarged and greatly more vascular, and the pulse very commonly rises a little, when the mother may complain of headache. A febrile condition has indeed been described by the older writers as a normal accompaniment of the establishment of the secretion, but the constitutional symptoms to which the local determination of blood at this time gives rise can scarcely with propriety be described as a fever. This is true, at least, in regard to all ordinary cases; but it is by no means an unusual occurrence for the patient to be attacked with a rigor, which is generally slight, followed by heat of skin, rapid pulse and headache—symptoms which are relieved by free perspiration and a copious secretion of milk.

This is what is commonly known as Milk Fever, and is identical with what is otherwise described as ephemera or weed. Whatever the degree of fever may be, the state of the breasts requires prompt attention. One of the advantages of putting the child early to the breast is that it draws out the nipple, which may be small or flat; and what is now very likely to occur, should this have been omitted, is a projection of the areola, which participates in the tumefaction of the rest of the gland, so that the nipple falls in as it were on a level with the skin, when it becomes a matter of some difficulty for the child to seize it. Putting the child to the breast is the natural and almost instinctive method which the woman adopts for the relief of the painful distension which she experiences, but as the child at first drinks but sparingly, it may be necessary for the nurse to relieve the gland by the use of the breast-pump or otherwise, aided by gentle frictions with olive or camphorated oil. These may be directed more especially to such portions of the gland as may show a tendency to induration or knotting, due in the first instance to local accumulations of milk, and subsequently, if neglected, to inflammations of the surrounding tissues, which may proceed to abscess. It is always of importance to keep the breasts cool at this stage, and it may even be necessary to keep down the temperature by evaporating lotions when there is reason to apprehend the more violent action which is apt to culminate in abscess. No small amount of suffering arises in some instances from the weight of the inflamed gland, which gives rise to dragging, and aggravation of all the symptoms. This condition can fortunately be greatly relieved by the simple expedient of suspending the breast by means of a handkerchief slung round the neck.

It is a very usual thing for nurses to put the child frequently to the breast, with the view of relieving such symptoms as are here described. This, however, should always be done with caution, and in view of the whole circumstances of the case. For, it must be remembered that this effect of the contact of the child is not only to empty the breasts but also to stimulate them to increased secretion, and if this latter effect—as it well may be—is in excess of the former, the treatment is obviously injudicious, and is likely either to precipitate the direct effects of inflammation, or to induce an excessive secretion of milk, which in most women has a serious effect upon the general health. Besides, the too frequent contact of the child is apt to cause certain painful affections of the nipple, to which we shall afterwards advert, and is by no means free from risk to the child itself.

The *Colostrum*, or milk first secreted, is somewhat irritant, and thus has a satisfactory effect in removing, by its laxative action, what remains of meconium in the bowels, and in preparing the mucous membrane of the alimentary canal for its functions of assimilation and excretion; but the too frequent ingestion of this, or even of perfectly developed milk, is apt to keep up a continuous digestive action in the stomach, and give that viscus no time to rest; and even when the child sucks vigorously, the repeated overdistension of the stomach only results in rejection again and again of what has been swallowed. The mother ought, if possible, on each occasion, to put the child to both breasts, as the emptying of one, and leaving the other in a state of complete distension, as is sometimes done, is not likely to contribute much to her comfort. It is always better partly to empty both breasts than wholly to empty one.

It is therefore of great importance that the mother should be warned from the first not to put the child too frequently to the breast. If the child sleeps by her side this is the ready method of cure for restlessness and screaming fits, and the child is often allowed to fall asleep with the nipple in its mouth; but, if it once contracts this habit, it may become impossible for it to be put to sleep in any other position, while it drinks at intervals without the consciousness of the mother. This, of course, an experienced nurse will never permit, but it is a matter of greater difficulty to determine what is sufficient nourishment for an infant, and at what intervals it should be given. This would perhaps fall more properly to be considered in the following chapter, but as it involves the interests of the mother as well as those of the child, we may here observe that it is of much importance to accustom the child from the first to drink at regular intervals. These, to begin with, may be every two hours, or if the child be premature or feeble, and on that account able only to take a small quantity of nourishment at a time, it will be necessary to put it to the breast at shorter intervals. But the object of the mother should always be to increase the interval until, after the second or third week, the infant becomes accustomed to take its natural nourishment every three or even four hours. This enables the mother to have her natural rest, and allows of the steady and satisfactory filling of the breasts against the stated periods.

It often happens, in women too who have an abundant supply of milk, that much disappointment results from the frequent escape, and consequent waste of the secretion. A certain amount of overflow, just at the commencement, when the breasts are tumid and distended, is so far beneficial; but when this goes on,—independent, it may be, of the amount of the secretion—it comes to be a serious matter, and may give rise to no little perplexity and annoyance. The milk which thus runs from the breasts may keep the woman in a constant state of moisture and discomfort, and although it is possible to collect the fluid discharged in small vessels which are used for the purpose, and even to give it to the child by a spoon, this is always an unfortunate occurrence. It often happens that, by careful attention to the period at which the child should be put to the breast, on the one hand guarding against over-distension, and on the other avoiding frequent and irregular applications of the child, much may be done to prevent this loss. In some cases, when the glands reach a certain stage of distension, the woman is conscious of a feeling of momentary discomfort, and then of involuntary contraction, immediately after which the greater part of the accumulated secretion is expelled, not unfrequently in jets. In other instances, this spasmodic contraction is excited by the contact of the child, when both breasts are simultaneously the seat of contraction, so that while the infant is half choked with the milk of one breast, that of the other is expelled in jets as before. In another class of cases, the application of the child is attended with acute pain in the breast of a neuralgic character, sometimes, indeed, so severe as to cause the woman to cease nursing. Emollient and sedative applications, such as belladonna, have been employed, with the view of soothing this painful affection; but in some cases it defies both these and internal remedies, and ultimately compels the woman to yield.

Every conceivable shade of difference is found to exist between different women, even of the same constitution and temperament, in the quantity of the lacteal secretion, and also in regard to its quality. In one case, we find a delicate, fragile woman, who may even be the subject of constitutional disease, and who is, nevertheless, overburdened with milk; while, in the next which comes under our notice, a young, robust, and vigorous woman, who has never had an hour's illness, fails completely in so far as the lacteal function is concerned. We do not, of course, mean to imply that such are common cases, but they are certainly not such as would cause the experienced practitioner a moment's astonishment. The commencement of lactation may, in like manner, be ushered in with all the usual symptoms, and be at first abundant, only to fail in a few days; while, in another, the secretion is ultimately satisfactorily established after a period of doubt and difficulty. Although, therefore, we know that strong and healthy women are more likely to prove good nurses, we can never be certain, until a week, or even longer, has passed, how the case, in this respect, is likely to turn out. There is no doubt that, although there are other conditions which influence the secretion of the milk, the state of the uterus, and the natural sequence of events of which it is the seat, exercise an important influence, owing to the well-known sympathy which subsists between the organs.

In the condition which has been termed *Agalactia*, the secretion is either altogether arrested, or is manifestly insufficient in quantity for the nourishment of the infant. Among the most frequent causes which lead to this condition are acute diseases, more especially if they immediately succeed the period of delivery. It is, in fact, one of the most common symptoms of those febrile diseases which sometimes supervene on the puerperal state, to the alarm of the attendants, and not seldom with the most disastrous results; and the failure of the secretion is always looked upon as of more serious import, if it is accompanied by the premature cessation of the lochia. But, independent of any other marked or serious symptom, there is sometimes a simple failure of the discharge, where it is difficult or impossible to recognize the cause.

We are not, however, to suppose that such failure is conclusive evidence of permanent incapacity, on the part of the woman, to discharge this natural function. If due to a febrile condition of moderate duration, the discharge will often reappear with the abatement of the pyrexial symptoms; so that, by feeding the infant artificially for a time, we may wait until we see whether or not the function will be re-established. This will be furthered by the application of warm fomentations to the breasts, and of late years the leaves of the castor-oil plant have been extensively used as a local application with the view of increasing or exciting the secretion. For this purpose the leaves are to be boiled in a small quantity of water and are to be applied along with the water in which they have been infused, in the form of a fomentation.

The quantity of the lacteal secretion is, under no circumstances, to be accepted as a criterion of its quality. The eye enables us, in some measure, to judge of the abundance of the corpuscular elements upon which the nutritive value of the secretion mainly depends. This may, however, be more accurately ascertained by means of a lactometer, or by the use of the microscope; but it is to be remembered that the richest milk is by no means that which is necessarily best suited for the child.

Galactorrhœa, or a too abundant secretion of milk, has been described under two forms, involving very different conditions and management. In the one, the quantity alone is abnormal, the nutritive value of the secretion being unaffected, so that our object in treatment would naturally be to guard against such an unnecessary drain upon the mother, as might be expected ultimately to compromise her general health. In this variety, the effect produced upon the child may be perfectly satisfactory, the only inconvenience, in many cases, being from the rapidity and abundance of the flow from the reservoirs within the gland, so that the mouth of the child fills much more rapidly than it can swallow, to its great and obvious discomfort. The treatment of such a case should consist mainly, if not entirely, in regulation of the diet, watching narrowly the while what effect is being produced upon the health of the mother, and adopting such means as may seem necessary for its rectification, by the partial arrestment of the discharge or otherwise.

In the other variety of galactorrhœa, the conditions are widely different. Here, too, there is abnormal abundance; but, in addition, we find that the increase in bulk depends mainly or entirely upon an augmentation of the watery part of the fluid. Not only is this a state of matters extremely unfavorable to the infant, but it is often observed to exercise an unsatisfactory influence upon the mother. Indeed, in extreme cases, so serious and so obvious are the effects thus produced, that the expression "Mammary Diabetes" has been suggested by the rapid emaciation which occasionally supervenes. Along with great feebleness, there unfortunately exists sometimes, in these cases, complete loss of appetite, so that it is almost impossible to combat the symptoms by what we might judge to be appropriate diet. When the anorexia is less marked, the digestive functions may be disturbed,—gastric and intestinal disorders being of frequent occurrence, taking the form, it may be, either of vomiting with heartburn and pyrosis, or of obstinate diarrhœa with flatulent distension and tenesmus. In those cases, ordinary remedies may prove of little avail, and after a few weeks of struggle it will become evident that no alternative remains except to wean the child, and take such other measures as may permanently arrest the secretion. This affection is believed to be particularly dangerous to those who have any phthisical tendency.

From what has been said, it will be sufficiently obvious that the Management of Lactation must not unfrequently be a prominent part of the duties of the accoucheur. Nothing, in this respect, is more important than that the diet of a nursing woman should be, in quantity and in quality, such as is most likely to conduce to the health of the child, as well as to her own. In the case of a perfectly healthy woman, but little attention to regimen is required,—nothing further being necessary, in such instances, than that the woman should avoid any imprudence in diet, while in other respects she need make no change in her ordinary habits. The pregnant state, however, and the subsequent exhaustion which attends the process of parturition, very generally leave the woman in a condition which manifestly requires generous treatment, in order that the health may be re-established, while provision is made for the special drain on the system which the function of lactation involves. Among the higher classes, where luxurious habits tend to the diminution of constitutional vigor, and among the inhabitants of towns, the necessity for such treatment is much more prominently marked than in country districts, where a life of physical exertion, spent, to a great extent, in the open air, implies hygienic conditions which are the very opposite of those which we observe in the other case. In ordinary practice, however, the necessity for a liberal dietary is so universally recognized that there is a danger of falling into a routine practice in this respect, the result of which will, undoubtedly, in some cases, be the reverse of beneficial.

As the results of some experience and close observation, we are convinced that indiscriminate overfeeding and stimulation of nursing women is a more frequent cause of the disorders of early infancy than is usually supposed. Nurses and mothers can readily understand how a thin and watery milk should fail to nourish the child, but it is by no means so easy to convince them that a specimen rich in nutritious elements may possibly be, from its very richness, the cause why an infant does not thrive. We have again and again seen cases of obstinate diarrhœa, with or without vomiting and other symptoms of gastro-intestinal derangement, which could only be attributed to this cause. Drugs are of no avail; the appearance of the mother may be such as to prevent even a suspicion of any fault on her side, and yet strict inquiry as to what she eats and drinks often points clearly to the simple and only proper treatment. It is to the use of stimulants that the attention should in these cases be more particularly directed; for we often find that women are encouraged, without any reference whatever to their general health, or the state of the milk, to take considerable quantities of ale or stout, or of the stronger wines. Diminishing the quantity of these stimulants, and in some cases absolutely forbidding their use, will certainly, in many instances, be followed by a marked and immediate amelioration in the symptoms. But, even when stimulants are not admitted into the dietary, the cause may still be discovered in the habitual use of food which is too stimulating in its character, or which is given in too great quantity.

An interesting series of observations, bearing directly on this subject, have been deduced from analyses conducted by M. Péligot, with the view of ascertaining the nutritive value of the lacteal secretion at various epochs. From these analyses it would appear that the longer the milk remains in the breast, the thinner and more aqueous does it become. It has been clearly established, further, that the milk which first flows from a distended breast—this being the portion soonest secreted—is comparatively watery, and that the quality of the milk becomes richer as the gland is progressively emptied. Hence a very obvious indication of treatment. When, for example, the child seems to be suffering from too rich milk, and there is reason to suppose that it is put too frequently to the breast, before the gland has time to fill, it may suffice to extend the period between the repasts, which, by giving the gland time to fill, also insures that the child obtains a less rich milk, and one more suited to its digestive capabilities. And we believe that the same facts may possibly be turned to account in the treatment of the opposite class of cases, where the secretion is too watery, and yet abundant, by partially emptying the breast before the child is put to it, so that, the more watery portion of the milk being removed, the child obtains the more nutritious residue.

The duration of lactation varies very considerably. It may cease quite unexpectedly, a few weeks, or even days, after the secretion has been established, or it may last for years. Between these two extremes the range is obviously great; but, as a rule, in cases in which the whole circumstances are perfectly normal, the average duration may be set down as from twelve to fifteen months. This is, of course, supposing that the woman goes on nursing, and that nothing is done with the view of interrupting the function. The influence which is produced upon lactation by the menstrual function, is a subject in regard to which very vague ideas are sometimes entertained. As a rule, a woman does not menstruate while she continues to nurse, so that no disturbing influence from this source normally exists. In a very considerable number of instances, however, she menstruates after five or six months; and, in a small proportion of cases, the menstrual function is regularly discharged during the whole period that she gives suck. Much discussion has taken place as to the influence which the constitutional disturbance inseparable from the menstrual molimen exercises on the process of lactation; and the question is often put to the medical attendant, whether the appearance of the catamenia is a sufficient reason for ceasing to nurse. It is beyond doubt that, in a large number (probably the majority) of cases in which menstruation occurs during lactation, no perceptible effect is produced upon the child. It is equally true, however, that marked disturbance of the one function attends the premature establishment of the other, as is evidenced by the most delicate of all tests,—disturbance of the functions of the child, which in some cases is very marked, and recurs at successive menstrual epochs. We must not, therefore, in replying to the question stated above, rashly assume, either that menstruation forbids nursing, or that it is to be disregarded. The truth lies between the two, and the solution of the question is to be found in a careful observation of the effects which are produced on the mother and child; upon which alone a definite opinion can be formed.

It sometimes happens that a woman becomes pregnant while she is still nursing, although the rule is that, during lactation, the generative functions are in abeyance, in so far, at least, as ovulation is concerned. In the exceptional instances referred to, it is not too much to suppose that, the whole generative force being diverted into a new channel, the nursing power must necessarily diminish; and that this is actually the case, is the experience of all who have watched these phenomena most closely. During the first weeks of such a pregnancy, the lactation may be but little disturbed, although there is good reason to believe that a failure in the amount of the milk, or an alteration in its quality, precedes, not unfrequently, the period at which the woman becomes conscious of her state. On the whole, we do not hesitate to assert that the existence of pregnancy is a clear indication that the woman should cease to nurse.

The important function of lactation is liable to certain disorders, or disturbing influences, the management of which comes necessarily under the duties of the medical attendant. The most familiar of these is, undoubtedly, Inflammation of the Mamma, and, when we consider the sudden determination of blood, and consequent turgescence of the gland, our feeling may be one of astonishment, not that it often inflames, but rather that it, as a rule, escapes inflammation. From whatever cause it may spring, the condition of the gland during the puerperal state must manifestly be such as to favor the extension of inflammatory action which has arisen within the structure. Exposure to cold, the irritation of sore nipples, and constitutional disturbance of various kinds, are a few, among many causes leading to local inflammation, which almost invariably attacks, in the first instance, the tubular structure of the gland. But a mere local affection of an external organ of limited extent, would probably be looked upon with little alarm, were it not for the fact that there here exists a peculiar liability to the formation of pus, resulting only too frequently in the formation of *Mammary Abscess.*

It is said that women of a weakly, delicate, or scrofulous constitution are peculiarly liable to mammary abscess; but whether this be the case or not, there are many cases in which, in women of perfect health and vigorous constitution, this troublesome affection quite unexpectedly manifests itself. There is, certainly, a great tendency to its reappearance in those who have suffered on a former occasion; but beyond this there is no marked predisposition upon which we can rely. The inflammation which precedes the formation of abscess is, if it be at all severe, ushered in by rigors, which are often of considerable severity. This is immediately followed by fever, and very shortly by lancinating pain in the breast, which is increased on pressure. The site of the pain, usually circumscribed, is further indicated by the presence of swelling and hardness, which, in favorable cases, become gradually resolved as the inflammation subsides, without the formation of pus.

But when abscess forms, the progress of the case is widely different. The inflammatory action, commencing, as we have seen, in the glandular structure, extends to the cellular tissue. The tumor, hard before, becomes less circumscribed and softer, although no less painful. The general symptoms are unabated; and, as the swelling still further increases, the cutaneous surface becomes hot and red, and ultimately œdematous, and glazed or shining. The latter symptoms indicate the formation of pus, the presence of which is still more clearly manifested by the feeling of fluctuation, which becomes more and more distinct as the cavity enlarges, and the pus approaches the surface. With the formation of matter there may be a renewal of the rigors, and there is generally painful throbbing and exacerbation of the fever. Finally the cutaneous tissues yield, and the abscess bursts, discharging its contents, to the great relief of the patient. Unfortunately, however, her troubles do not always cease here; for, under the influence of a protracted drain on the system, she may be reduced to a condition of deplorable weakness, which may be aggravated by obstinate gastric or intestinal derangement, or by profuse night-sweats. The cases which are, in the first instance, the most severe, are not necessarily those which ultimately produce the most serious effect upon the patient. It is true that the symptoms are, at first, in proportion to the violence of the inflammation and the extent of the abscess. But, on the other hand, the violence of the attack is often, under such circumstances, apparently expended; and, unless the discharge is abnormally protracted, the gland may gradually resume its healthy condition and normal function, while the constitutional symptoms rapidly disappear.

In another class of cases the symptoms at the outset are comparatively moderate, and the abscess correspondingly small. When the latter discharges itself, or is relieved by operation, the cavity contracts, and we imagine that the case is at an end. But ere long the former symptoms reappear, a second abscess forms, runs its course, and discharges its contents as before; and in some cases a succession of such local inflammations, individually of limited extent, may produce, collectively, such effects as more seriously to influence the health than a case which may at first have excited more apprehension in our minds. In those cases of repeated small abscesses, there is often extensive induration, which may affect the whole, or the greater part of the gland, especially that part of it immediately surrounding the nipple.

The result of severe inflammation of the mamma, whether the abscess be single or multiple, usually is to destroy the nursing function of the gland. It is not that the secerning function of the gland is necessarily, or even generally, arrested; but rather that the application of the child is attended with such pain and irritation that it is at once impossible and undesirable. If the matter has been allowed to make its way to the surface, it often happens that a certain amount of sloughing occurs of the tissues surrounding and immediately subjacent to the orifice. By the same process the continuity of the galactophorous tubes is also occasionally destroyed, and, as a consequence, a lacteal fistula is established. The continued secretion of milk in the unaffected portions of the gland is sometimes a serious obstacle, in this and other ways, to the satisfactory issue of the case; so that it is proper, in many instances, by friction or the external application of belladonna, to do what we can to arrest permanently the function of the mamma on the affected side. It sometimes happens that, by sympathy or otherwise, the other gland becomes similarly affected by inflammation and abscess, which, of course, makes the case a much more serious one.

The treatment of inflammation of the mamma is thus, it need scarcely be observed, a matter of the highest importance. The initiatory phenomena of inflammation are to be combated by a careful management of the secretion, which should not be permitted to accumulate within the gland. This is, however, a matter of considerable difficulty; for, while the application of the child, or the breast-pump, is often productive of irritation, rubbing of the breasts, which is the other alternative, is apt to increase it also. Cold or evaporating lotions are not to be depended upon; so that we are often obliged at once to have recourse to leeches, fomentations, and poultices, just as we would in the case of the inflammation of any other gland.

Should all our endeavors fail—as, unfortunately, they often will do—to arrest the inflammation, the earliest indications of the formation of pus are to be earnestly looked for. So soon as fluctuation can be detected, however faintly, the case may, we believe, often be cut short by early puncture, by means of an exploratory trocar or needle, which, by giving vent even to a few drops of pus, relieves tension, and often, apparently, arrests the course of the disease. Where fluctuation is already distinct, and near the surface, free incision should be practiced, on ordinary surgical principles, in the most depending part, so as to give immediate egress to the pus which has formed, making the opening—in order to avoid the lacteal tubes—in a direction radiating from the nipple. Both before and after the operation, great comfort is afforded to the woman by suspending the breast, by means of a handkerchief tied round the neck. In the case of a large abscess, the contraction of the cavity may be promoted by the application, externally, of broad strips of sticking-plaster, so adjusted as to contract the cavity within which the matter lies. In other respects, the affection is to be treated as an ordinary surgical lesion, while the general health must, of course, be carefully attended to. Whenever much trouble is encountered in the treatment of mammary abscess, we should not delay in ordering the removal of the child from the breast.

Excoriation and Fissure of the Nipple are affections so common, and withal so troublesome and painful, that their treatment should be a matter of interest to every careful and judicious practitioner. Although in themselves they are comparatively of little moment, they are of peculiar importance as causes of the more serious affections which we have just been considering. Much may, undoubtedly, be done in the way of prevention.. Women, among the higher classes especially, should be instructed to lave the nipple, for many weeks before delivery, with some mild astringent or stimulant lotion, such as a weak solution of tannin in rose-water, or any dilute spirit. When, however, excoriation has already taken place, the nurse should be instructed to apply some very gentle astringent at first,—nothing being better than a strong infusion of tea. Failing this, the applications above recommended for prevention may be tried, or other similar medicaments,—of which there is an endless variety,—may be adopted. Care must, however, be taken to avoid such substances as may be prejudicial to the child,—such as acetate of lead; and in all cases the application should be washed off very gently before the infant is put to the breast. In the more obstinate cases, the following will be found an admirable substitute:

℞. Acid. Tannici, ...	gr. iij.
Glycerin, ...	ʒss.
Unguent. Cetacæa, ad	℥j.

Sig. To be used as directed.

Fissures or chaps are even more troublesome than excoriation; for, although they may at first be but trifling, every application of the child tends to tear them open, and undo the healing process of the interval. The above, or any similar ointment, will here also be found of great use, the best method of application being to introduce it into the chap by means of scraped lint. Should the margin of the fissure become callous, it may be necessary to apply freely the solid nitrate of silver. The nipple-guard, or shield, is, in all cases, useful in protecting the affected parts from the pressure of the dress; and, when much pain is experienced in the act of suckling, the artificial nipple should be employed, which will protect the parts from the violence to which they are often subjected by the vigorous sucking of a healthy child. In some obstinate cases, the irritation is such that it may ultimately be found necessary to remove the child permanently from the breast, and to obtain the services of a hired nurse.

CHAPTER XXXIX.

THE NEWLY BORN CHILD.

MANAGEMENT OF THE CORD—CLOTHING—CLEANLINESS—LIGHT AND AIR—COLOSTRUM: IMPROPER USE OF LAXATIVES—THE MOTHER TO NURSE IF POSSIBLE—SELECTION OF HIRED NURSES; THEIR DIET AND REGIMEN—CAUSES OF DIFFICULTY IN SUCKING—CONGENITAL MALFORMATIONS—THE EXCRETORY FUNCTIONS—DIARRHŒA: SIMPLE OR "CATARRHAL," AND INFLAMMATORY OR "DYSENTERIC" VARIETIES: TREATMENT OF EACH—CONSTIPATION: MANAGEMENT OF—ICTERUS NEONATORUM—THRUSH—ARTIFICIAL FEEDING: SUBSTITUTES FOR BREAST MILK: COW'S MILK, DILUTED AND SWEETENED; NURSING-BOTTLES: NURSE TO BE PROCURED IF CHILD DOES NOT THRIVE: OTHER ARTICLES OF DIET: LIEBIG'S FOOD FOR INFANTS—WEANING—DENTITION.

THE subject of this chapter has reference to certain points relative to the management of the infant after its birth, and the treatment of some of the more common ailments which are apt to attack it during the first weeks or months of its existence.

So soon as the nurse has, after the termination of labor, attended to those matters of detail which are essential to the comfort and safety of the mother, her attention is naturally turned to the child, which is then to be washed and dressed. The first point to be looked to, after it has been thoroughly cleansed by soap and warm water, is the stump of the cord, which undergoes a process of putrefaction, and, ultimately, in the course of a few days, separates at the cutaneous margin of the umbilicus. The decomposition of the tissues of the cord takes the form rather of withering than of moist putrefaction; but before it drops off, there is generally more or less of the odor characteristic of the process which is going on. To obviate this, it has long been the practice to wrap the cord in cotton or linen, passing the stump, in the first instance, through a hole which has been *burnt* in the fabric, so as to secure the antiseptic action of the charred margin. This, of course, is not essential, but is, undoubtedly, favorable to cleanliness; and the dressing may be renewed at proper intervals, to be determined by the amount of moisture which makes its appearance, and which will depend, in a great measure on the thickness of the cord. For some time after the separation is complete, there remains a tendency, more or less marked, to the formation of umbilical hernia. This is particularly noticeable in the case of children who are subject to screaming fits and to the straining which accompanies them; and is in all cases to be guarded against by the application over the umbilicus of a soft pad, formed by several folds of linen, which is retained in position by a broad bandage of flannel with which the abdomen of the child is swathed. By increase in the thickness or otherwise, the pad may be so modified, in cases in which protrusion is threatened, as to retain the bowel within the abdominal cavity.

The clothing of the child is in some measure to be regulated with reference to season and climate. In all cases, however, it is to be remembered that birth almost necessarily involves a sudden and considerable diminution of temperature. Any failure, therefore, in the vigor of the circulation, such as may be anticipated in premature delivery, is very likely to be attended with a corresponding diminution in the temperature of the body, which not unfrequently involves great and sudden risk to the life of the child. The maintenance, therefore, at first, of an equable temperature is of the highest importance, and is universally recognized. On these grounds, flannel—which, as a bad conductor of heat, tends materially to sustain a steady temperature—is, to a great extent, employed in the clothing of infants. It has also the advantage of absorbing the discharges to some extent, and thus preventing any irritation which may arise from their prolonged contact with the cutaneous surface. While the infant is thus wrapped in its swaddling-clothes, care should be taken so to arrange them as to admit of free movement of the limbs from the first. It was at one time supposed that the head of the child should be protected as carefully as its trunk; but the general practice now is rather to keep the head cool, so that, in this country at least, it is the exception rather than the rule, to put even a light cap on the head of a child. Important as the maintenance of an equable temperature is in all cases, it is much more so when the infant is brought prematurely into the world,—when it is necessary, in order to maintain the circulation, to swathe the limbs in cotton-wool, at least during the first few weeks after birth. In all cases, for the first few months, the heat of the trunk and lower limbs is further insured by the use of long clothes.

Strict cleanliness is essential to the well-being of the infant; and in nothing is the difference between a good and a careless nurse more clearly evidenced than by the management of the napkins, and the protection of the parts from the contact of urinary and fecal discharges. Neglect here frequently gives rise to troublesome excoriation of the nates, or in the flexure of the groins; and nothing, perhaps, is of more importance than that the child should be kept dry as well as clean. The use of the warm bath is universal; but, as regards the frequency with which it is to be employed, some degree of discretion may be exercised in individual cases. Many nurses, after the first few days, undress and bathe the infant, if perfectly healthy, night and morning, and apparently with benefit as well as with safety. Caution should, however, in this respect, always be enjoined, as, in some instances, too frequent bathing seems to produce an exhausting effect; and, in the case of feeble or sick children, it may only be possible to insure cleanliness by rapid sponging, while the bath is either avoided altogether, or repeated only at intervals of two or three days. During the first six weeks, the child should not be permitted to remain in the bath for more than four or five minutes.

Light and air are as essential to the growth of a child as to that of a plant. At first, however, caution is, even in these respects, necessary.

A dim and subdued light is thus most suitable, until the organs of vision become, in some degree, accustomed to the new stimulus; and, in like manner, until the new function of respiration, and the maintenance of temperature, are efficiently and vigorously discharged, we must take care, in our anxiety for pure air, not to expose the infant to vicissitudes of temperature. In the warm weather of summer it may be taken out somewhat earlier, although, as a rule, it is better not to carry the child out of doors before the end of the second week; but, when this stage has been reached, nothing, perhaps, is of greater importance, or has a greater effect on the health and development of the infant, than its daily exposure in the open air, clothed according to the requirements of the season.

During the weeks which immediately succeed its birth, the infant passes the greater portion of its time, by day as well as by night, in sleep; but in this respect there is great variety, even with healthy children. For example, it often happens that they sleep quietly and almost continuously during the day, awakening only at intervals to go to the breast, while at night they are wakeful and restless. This, after a time, is often rectified by the management of an intelligent nurse, who, by keeping the child awake during a part of the day, or it may be by bathing it at night instead of the morning, succeeds in breaking the habit, to the great relief and comfort of the mother, who otherwise has her rest broken and her nursing powers impaired. Sleep is certainly encouraged, and often very markedly so, by the daily exposure to the open air.

The child should, for various reasons—some of which have been previously mentioned—be put early to the breast. The laxative action of the *Colostrum* generally produces the discharge from the bowels of the dark-colored meconium which is lodged there. It is too much the habit of nurses to dose the infant with castor oil, under the idea that it is necessary in order to set up the excretory function of the bowels. The practice is no less deleterious in its results than it is irrational in theory; and, in point of fact, there is no more fruitful cause of subsequent gastric irritation and intestinal derangement. The accoucheur should therefore put his absolute veto on any such treatment without his sanction, at least during the period while he remains in attendance. It is no doubt more frequently necessary when the child is being nourished with substitutes for breast-milk, but in a great majority of cases. it is, to say the least, perfectly unnecessary. Another very general practice is, during the first two days, before the secretion of milk has been thoroughly established, to feed the child with sugar and water. The effect of this, too, is often the reverse of beneficial, as this syrup is not only unsuitable to the nourishment of a newly-born child, but it is also apt to derange the functions and to give rise to ulterior ailments, which may be the cause both of trouble and anxiety. A mixture of cow's milk and water, with a very small proportion of sugar, —or, better still, of sugar of milk,—is a more eligible substitute; but so soon as the milk becomes abundant, all such methods should be abandoned for the natural secretion of the mother's breast.

Every mother should be encouraged to nurse her own offspring, unless under certain exceptional conditions, which have been referred to in the preceding chapter. For not only is this to her advantage ultimately, by preventing too frequent pregnancies, but it is to the advantage of the child, by furnishing it with what nature has specially provided for its support. What has already been said with reference to the function of lactation, is sufficient clearly to show how important is the management of that function, in its bearing upon the child, no less than upon the mother. Care should be taken from the beginning to put the child to the breast at something like fixed intervals,—which at first may be two hours, but which should afterwards be extended to three, or even four hours. This, by allowing the breasts to fill, and permitting the mother satisfactory and continuous sleep, goes some way to maintain the quality of the milk; while, as regards the child, it gives the digestive and assimilative functions time to rest. There is certainly no more fertile cause of the minor digestive derangements, than the habits which prevail among the ignorant, of constantly putting the infant to the breast, as the ready method of cure for restlessness or screaming fits.

Various circumstances,—sometimes occurring quite unexpectedly,—may render it impossible that the mother can nurse her infant. When this is the case, the medical attendant should always recommend that the services of a hired nurse be at once obtained; and if this recommendation be acted upon, the duty of selecting a nurse devolves naturally upon him. This is a matter of no small importance. From what has been said in the preceding chapter as to the nutritive value of the milk in different cases, it will be obvious that some caution must be exercised, and especially that we should not too hurriedly infer, either from the abundance or the apparent richness of the milk, that the woman is to be looked upon with confidence, as necessarily a good nurse. There are certain other matters in regard to which it is our duty to inquire. We thus look narrowly, and as a matter of course, to the general health, circumstances, and age of the applicant; a perfectly healthy young woman, from a country district, and between the ages of eighteen and twenty-eight, being generally preferred. With reference to general health, some have attached considerable importance to the state of the teeth, as affording a reliable indication; and, although this has certainly been exaggerated, there can be no doubt that the early loss of the teeth, and especially of the front teeth, by decay, is so far an unfavorable symptom. It is obviously our duty to determine, in so far as this may be possible, whether she is the subject of any disease which may be transmissible to the child. Any evidence, should it but amount to a suspicion, of serious organic disease, and especially of a phthisical tendency, may be held to warrant rejection. Unfortunately, the circumstances are such, in many cases, as to admit of, at least, the possibility of a syphilitic taint, and this is, therefore, a point in regard to which we should very specially be on our guard. To glance at the throat, the skin, the glands of the neck, and the hair, are, on this account, matters almost of routine in such investigations. We should also examine the breasts,—not only with regard to their secretion, but as to the state of the nipple; and the presence of severe excoriations, and still more of fissures at the base of the nipple, are to be held as unfavorable conditions. And this for various reasons,—one of the most important of which is the fact, that we can have no confidence that she will prove a zealous and attentive nurse, if any application of the infant to the breast is attended with discomfort or suffering. If we have a choice in the matter, we should also select a nurse whose condition, as regards the age of the milk, may be as nearly as possible that of the mother, and if any change is permitted, it is better that she should have been confined a little later than before her. It is always a matter of importance to be able to see the child of the nurse; and its condition may often be held to indicate the nutritive value of the milk. There are, of course, other matters, which have reference to the character and disposition of the woman, or to the fact of her having had previous experience in the rearing of children, which may be held as being of no small importance; but these are, perhaps, questions which do not so immediately come under the cognizance of the medical attendant.

The diet and regimen of hired nurses is a matter to which some prominence should be given. It is, indeed, of greater importance in this case than in that of the mother, that no overfeeding or other similar imprudence should be permitted. The simple rule in all such cases should be that the woman is supplied with plain and easily digested food, which, in point of quantity, should be ample, but, at the same time, not more than is requisite for the maintenance of perfect health. If, with the view of contributing to the health and vigor of the child, the nurse is plied, as is often the case, with strong soups, gruel, and stimulating articles of diet, at short intervals during the day, the result is likely to be exactly the reverse of what is anticipated, and the child suffers from over-richness of the milk, while the nurse becomes rapidly fattened. No rule can be laid down, however, as to the diet suitable for nurses, beyond this,—that a large proportion of their food should consist in the simple and possibly frugal fare to which they have been accustomed. In this way the danger to which we have referred may always be avoided, but everything will, of course, depend upon the habits of the country or district from which the nurse has been procured. In the rural districts of Scotland, for example, oatmeal, in the form of porridge, and generally eaten with buttermilk, is one of the most important items in the daily food of the masses, and is well known to be admirably adapted for women who are nursing, although it was some years ago stated in a report presented to Parliament on the dietary of the English prisons that the food referred to was "similar to what is used in England for the fattening of pigs." The habits of the English peasantry and of the lower classes in all large towns will require to be taken into consideration in the regulation of the diet. With us, beer and other malt liquors are seldom used, and are therefore, quite unnecessary; indeed it may be said that if a woman cannot nurse without stimulants, her assistance may be dispensed with. But in England, where the daily use of beer is all but universal, this, to which the woman has become accustomed, should always be given, as probably essential to the maintenance of her physical condition.

The infant, if healthy, instinctively seizes the nipple from the first and sucks vigorously, and indeed has often been seen to suck the finger of the accoucheur before the trunk was born. It is not, however, always so. The difficulty arises, in many cases, from a peculiarity in the conformation of the nipple, which may either be unusually small, or—what is more common—has been carelessly allowed to be pressed in by the dress during pregnancy. This may generally be got over by having the nipple drawn out by the nurse or by a strong child, by the breast-pump, or by a soda-water bottle used like a cupping-glass, care being taken not to permit the parts to relapse into their former condition. With care and proper management on the part of the nurse, this difficulty is seldom a serious one. The child may, in other cases, especially when born prematurely, be unable by weakness to take the breast, a condition which is highly unsatisfactory. The woman, in these cases, should milk her breast into the mouth of the child, when it will generally swallow the milk as it flows; or she may drain it off by the pump, and feed the infant by a spoon; but the objection to this is that it is a bad plan to use a spoon if it can be avoided, for the child thus becomes accustomed to the spoon, and still further loses the instinct for the nipple. An idea extensively prevails among the lower classes that when a child has difficulty in sucking or refuses the breast, it is "tongue-tied," but this is an obvious error. It, no doubt, does happen, although very rarely, that the frænum of the tongue is too short, or attached too far forward, but in ordinary practice it will probably not occur oftener than once in a lifetime that the accoucheur is obliged to divide the frænum for this variety of congenital malformation.

It is the duty of the accoucheur to examine the child after its birth, and to inquire on his subsequent visits as to the various functions, in order that congenital malformations may not be overlooked. It may thus become evident either immediately or shortly after birth that the child is affected with some peculiarity which must be remedied in order to save its life. Such malformations as harelip fall more properly into the domain of surgery, but in the case of an imperforate condition of the anus or urethra, the general practitioner must be prepared to act promptly. In the former, an operation is necessary by incision in the direction of the rectum, or it may even be necessary in extreme cases to form an artificial anus. Imperforate urethra, again, is rare, probably for the reason which is pointed out by Burns, that "generally the canal opens, in supposed cases of imperforation, about midway between the scrotum and glans penis;" and the result of experience seems to be that perforation of the glans seldom succeeds, so that it would probably be better to cut down upon the urethra than attempt to find its extremity. It may be necessary, even where there is no closure, to pass a probe or a very small elastic catheter into the bladder in consequence of retention.

We are often told, a considerable time after delivery, that the child has not made water. On such information, however, we must never act, unless there is some evidence of distension of the bladder. The urine is often voided in the bath, and thus escapes the notice of the nurse, and if retained for a longer period than usual, the application of cold water over the hypogaster, or a teaspoonful of cold water given by the mouth, will generally have the effect of causing contraction of the viscus. Nor is tardy action of the bowels to be held as necessarily indicating the administration of laxatives; for, in this as in the other case, nature generally will, if left to herself, bring the function into perfect order without any extraneous assistance. We must, in like manner, be cautious in the administration of such drugs as are usually employed in the treatment of diarrhœa. Be it remembered, in the first place, that there is, in healthy children, the greatest possible difference in the manner in which the bowels discharge their functions. In one, the frequency and the character of the evacuations may seem to amount to diarrhœa, and in another the dejections are habitually costive; but, so long as the infant remains in perfect health, drugs of all kinds are to be scrupulously withheld. In many cases, we may succeed in producing the effect which we desire through the mother, but we can scarcely be too scrupulous or cautious in any attempt to act directly upon the child.

Diarrhœa, although of more frequent occurrence during the process of dentition, may happen at any period subsequent to the birth of the child. A strict attention to the directions which have been given above will suffice, as we have reason to believe, in most cases, to avert many special conditions which are apt to lead to this troublesome affection; but, even under circumstances the most favorable, the diarrhœa of infants is only too familiar from its frequent occurrence. The ordinary "simple" or catarrhal variety of diarrhœa, which is the most frequent, is also the least serious; but, in the case of the newly born child, the enormous quantity which is sometimes poured out may reduce the strength of a puny infant so rapidly, as to place it in a most critical condition in the course of a few hours, without any evidence whatever of inflammatory action. If the action of the bowels is accompanied with obstinate vomiting, the case may be looked upon as much more serious in its nature; but simple, uncomplicated diarrhœa is seldom dangerous, unless it passes into the more serious variety. The appearance of the discharge, as seen on the napkins, varies greatly, from a watery and almost colorless fluid to a slimy matter, which may be frothy or bright yellow like the yolk of an egg, and in other cases green, mixed with fragments of curdled milk, and possibly streaked with blood. A much more alarming variety is when the diarrhœa takes the "inflammatory" or "dysenteric" form, when it is generally attended with corresponding gastric disturbance, and with a marked increase in the temperature and in the frequency of the pulse. Between the extremes, the varieties in individual cases are endless, and, consequently, the treatment which may be held as applicable in each must vary in a corresponding degree.

Unless on an emergency arising from the violence of the symptoms, we should always, in very young children, try the milder measures first. A teaspoonful of lime-water given with a little boiled cow's milk, or with the milk of the mother, has often a marked and immediate effect. The number of cases which may be traced to imprudence in the dietary of the mother or the nurse is, we believe, much greater than is generally supposed; and we would, therefore, recommend that this should always be inquired into, and, if necessary, modified without delay. Should the presence of blood in the stools, an appearance of tenesmus, and general inflammatory symptoms, indicate the existence of the more serious form, nothing has a better effect, if it can be retained, than castor oil with a single drop of laudanum. Among other available astringents are the tinctures of catechu or kino, which may be administered in the usual way with chalk mixture, to which may be added, in the event of flatulence being a concomitant symptom, a proper proportion of peppermint or pennyroyal water. The young practitioner cannot be too cautious in the use of opium in any of its forms; for, although he may thus succeed in checking the discharge, the benefit which results is often temporary in its character, and, indeed, the symptoms would sometimes seem to come on after opium worse than before. The bright green appearance of the evacuations, to which reference has already been made, is not to be looked upon as necessarily a very unfavorable condition; and one object in mentioning the fact at this place is that this condition seems somewhat too frequently to be admitted as a reason for the administration of powerful drugs. When, at a somewhat more advanced age, the child is being fed, an alteration in its diet and a recurrence to the simpler nourishment of the earlier months will often suffice to arrest the symptoms.

In the case of habitual *Constipation*, a favorite remedy is manna given with milk. Nothing is easier, of course, than to move the bowels, either by this, by castor oil, or by any other laxative; but it will generally be found that if we begin with laxatives, they must be continued. On this account, many nurses prefer to use an injection of soap—or to pass into the rectum a small piece of soap, which is cut so as to admit of its easy introduction. We cannot doubt, however, that a large proportion of such cases are unnecessarily treated, and would do quite well if left alone.

It is only possible for us very briefly to notice a few of the more common ailments which affect the infant shortly after its birth. The vulgar nomenclature of these disorders has unfortunately shrouded the subject with an obscurity, which the limited knowledge of most midwives rather tends to deepen. Such terms as "hives" and "gum" are familiar in the mouths of experienced matrons of the lower class; but, unfortunately, indicate nothing—or, rather, so many different things, that the words have lost any scientific signification which they may have had. One of the most common of the affections alluded to is what is known as *Icterus Neonatorum.* It was at one time generally supposed that this very common affection indicated some serious pathological condition, the liver and its function being supposed to be seriously implicated. The chief symptom of this familiar affection is a tinging, more or less marked, of the skin, which becomes of a yellow color. In immature or feeble children, this gradually deepens, and distinctly affects the conjunctiva; while the colorless condition of the evacuations points still more clearly to the analogy which subsists between this and ordinary jaundice. Although it may be too much to suppose, as some have done, that this is a "perfectly natural state, in which the skin and other secreting organs are called on for a few days to assist in disposing of the bile, until the demand for it to minister to the digestive function becomes equal to its abundant supply," we may, in the case of a child otherwise healthy, look upon the phenomenon in question without the slightest apprehension. If excessive, it is usual to give a grain of Hydrarg. c. Cretâ, followed by a small dose of castor oil; but even this is rarely necessary, as the discoloration generally passes off spontaneously, and almost as rapidly as it came on.

We may here briefly advert to one other of the affections of infancy, which is generally, although not invariably, associated with impaired nutrition. This is familiarly known under the name of *Thrush*. If we look into the mouths of children who are the subjects of this affection, we observe on the surface of the mucous membrane of the tongue, lips, and cheeks, a number of small, circular, white spots, which appear at the first glance as if minute portions of curdled milk had adhered to the surfaces in question. A more careful examination shows either that they cannot be detached, or, if so, that the subjacent surface presents an eroded appearance. Microscopic researches, as to the nature of this affection, have proved that it is due to the presence of a cryptogamic vegetation, which is, more or less obviously, associated with derangement of the digestive functions. It has been conclusively demonstrated that this may be transplanted from one mucous surface to another; and we have seen more than one case in which a troublesome affection of the nipples, and of the contiguous cutaneous surface, had apparently been directly produced by it. The treatment will consist in such measures as may remedy the digestive ailment upon which it is presumed to depend; and, at the same time, the local affection is to be treated by the application of a solution of twenty grains of borax in an ounce of water, which may be replaced in the more obdurate cases by a solution of nitrate of silver of four grains to the ounce of distilled water.

In cases in which the parents are not in circumstances to afford the services of a wet nurse, and in other instances in which there is an unconquerable repugnance to the employment of a hired nurse, it may be necessary, from the first, to rear the child by the use of certain substitutes for breast-milk—its natural food. Our primary object must, therefore, be to provide such nourishment for the infant as may, chemically and otherwise, most nearly resemble that which nature provides. Ass's or goat's milk probably approach in their composition nearest to the secretion of the mammary gland in the human female, and, if obtainable, may on that account be preferred. The objection to the milk of the cow is, that it is so much richer in the corpuscular element that, if given undiluted to a young infant, it rarely fails to engender some form of gastro-intestinal disorder. This however is, in the vast majority of cases, the best substitute which is within reach; and, as the fundamental objection to its employment is its richness, experience has shown that simple dilution with water furnishes a material by which hundreds of thousands of infants are, without difficulty, reared in this country. Still, even under circumstances the most favorable, it is obvious that the best substitutes for breast-milk are open to objections; and we are, therefore, not astonished to find that infants thus artificially reared are more liable to disease, and more likely to succumb to it. On this account alone, were there no other argument in favor of it, it is the duty of the accoucheur to insist, as far as he can, upon all children being reared at the breast; and in the case of children born prematurely, he should absolutely refuse his sanction to any proposal otherwise to nourish it.

The amount of water to be added to cow's milk will, of course, depend upon its quality. If rich and pure, an equal bulk, or even more, of water, may be added; but it is, in towns, at least, rarely necessary to add more than a third of water, in order to reduce an average specimen to the extent which is requisite. Such a mixture as this is, as compared with human milk, deficient in the saccharine element, and it is on that account usual to sweeten it with the ordinary sugar of commerce; but what should always be preferred, when it is within reach, is the sugar of milk, which is now prepared in considerable quantities for this purpose from the whey of cow's milk. The mixture should always be given warm, about blood heat, to which temperature, therefore, it must be artificially raised. A great variety of nursing-bottles have been devised, most of them being simple as well as ingenious in construction, with the object of enabling the child to suck from an artificial nipple at the extremity of the apparatus. In a word our whole object is—when a child has to be reared artificially—to assimilate all the conditions as nearly as possible to those which exist when the natural source is available. The success of bottle-feeding depends very greatly upon the care and experience of the mother or nurse, and upon nothing does the ultimate result hinge more than upon strict attention to cleanliness. It is well known that it is more difficult thus to rear a child in summer than in winter, from the rapidity with which, in the former case, the temperature acts upon the milk. It is also well known that, when the apparatus is not kept scrupulously clean, small particles of curd are apt to accumulate within it or the tube, and these, again, if swallowed by the infant, are more than likely to excite gastric or intestinal disturbance; but these difficulties are fortunately, in a large majority of cases, completely overcome, and the infants, if originally vigorous and mature, are often pictures of health.

So long as, under such alimentation, the functions of digestion and assimilation are perfectly discharged, we may well be content with the condition of the child; but when—as occurs in a certain proportion of cases—the child pines and is *not thriving*, the digestion is impaired, or obstinate diarrhœa supervenes, we must, without delay, adopt means for its relief. It is usual, when at all practicable, to obtain the milk for an infant from one cow, and what, in the condition alluded to, has often been found sufficient is simply to change the cow, as, under other circumstances, we might do with the nurse. But when this and other simple remedial measures fail in producing an effect, and the infant continues to dwine, we should lose no time in urging that a nurse be obtained at once. In many cases this is delayed until the condition of the child becomes critical, and the assistance of the nurse, when eventually obtained, is too late to rally the little sufferer from the condition into which it has fallen; and, in fact, this question often devolves a serious responsibility upon the medical attendant, who is certainly blameworthy if he fail to interpose his authority before it is too late.

The period at which other articles of food are to be permitted to the child, is another question in regard to which we are often expected to express an opinion. Much will no doubt depend upon the health of the mother, and the abundance or otherwise of the lacteal secretion, but we have great reason to believe that the tendency is considerably to anticipate the period at which a variety of diet is first to be permitted. We think we are justified in concluding that, for the first three months, milk and milk alone is the best as well as the most natural food for the child; but, in this as in most other respects, the safest and most reliable indication is to be found in the condition of the child itself. So long, indeed, as its appearance and development, the manner in which its functions are discharged, and the extent to which it enjoys refreshing and quiet sleep, indicate perfect health, too much caution cannot be exercised in sanctioning any change, unless indeed the interests of the mother should render it imperative.

Of the many substances which have been employed as substitutes for, or supplementary to milk in the alimentation of infants, nothing has, perhaps of late years, attracted more attention than the Food for Infants which was devised as the result of much original research by Baron Liebig.[1] Boiled bread and milk, arrowroot, corn flour, and a host of other simple and easily digested substances are extensively employed, the article selected depending more upon the fancy or prejudice of the nurse than on any marked superiority of one over another. Nothing, we are assured, is better than rusks, if they can be obtained of good quality; and if well made they require no boiling, but are to be covered for a minute or two with boiling water, which is then poured

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[1] This may be obtained in any quantity, carefully prepared by eminent chemists, but as its price puts it beyond the reach of the humbler classes, we are induced to borrow some sentences from a little pamphlet published on this subject by a lady, whose main object was to bring the food within the reach of all. "The ingredients required," she writes, "are the following:

Malt, ...	½ oz.
Second Flour, ...	½ oz.
Skimmed Milk, ...	6 oz.
Water, ...	1 oz.
Bicarbonate of Potash, ...	7½ grains.

"I may mention here, that after picking out other seeds which are often found among malt, and which may be injurious, the malt should be crushed in a mortar or ground in a coffee mill. Mix all the ingredients together, and put them in a pan thoroughly clean, boil for six or eight minutes, stirring all the time; remove from the fire, strain through an ordinary sieve or piece of muslin, and give to the child through a feeding-bottle. See that the holes in the nipple of the tube are large enough to admit of the food passing through them, and that it be not given too warm. The above quantity daily will be found sufficient for an infant for the first few days; but very soon it will have to be increased to two or three cupfuls, and more. For a new-born child who has to be fed entirely on this food, it should be made at first half milk and half water. Use *skimmed* milk; new milk is too strong. If properly made the food should be quite sweet, and taste as though sugar had been put into it; but sugar must on no account be used. The quantity required for twenty-four hours may be made at once, and heated for use as required. Malt can be had at the bakers, who use it for making bread. It is dry and slightly crushed, and should be ground fine before using; this can be done in an ordinary coffee mill."

off, and milk or cream, with a very little sugar, added before it is broken up. When the child grows older a little carefully made chicken soup or beef tea may be given twice a week; and, by thus adapting each change of diet with caution, it may be gradually altered so as to suit the increasing requirements of a higher stage of development.

Weaning.—The separation of the child from the mother involves something of a crisis in its existence, and is generally, as might be expected, attended with more or less constitutional disturbance. The condition of the mother must necessarily, as has already been shown, point clearly in many cases to the conclusion that the infant should, in her interest, be at once withdrawn. But, when circumstances are in all respects favorable, it has in every instance to be determined what is the proper period for weaning—what time, in the interests of both, is to be selected for the severance of that physiological tie which binds together the mother and her offspring. It is very unusual to wait until the occurrence of pregnancy, or the condition otherwise of the mother, show clearly that she is no longer able to supply proper nutriment to the child. Were we even to look at the case without any reference whatever to the maintenance of her health, a very little reflection should suffice to show that nursing beyond a certain average period is little likely to maintain the health or well-being of the infant; but as, in this matter, the interests of the mother are in a sense inseparable from those of the child, it is sometimes a question involving both care and discrimination absolutely to fix the time for weaning.

It has frequently been asserted that the natural period for separating the child from the mother is on the completion of the process of dentition; and it may, perhaps, be admitted that, theoretically, the idea is not destitute of validity. Every one knows, however, that, although it may be possible to nurse for two years—the period at which the first dentition is usually completed—the amount of milk secreted ceases long before that to be sufficient for the nourishment of the child. Indeed, the cases are exceptional in which a woman is able to suckle her child, without assistance in the way of extra aliment, for a longer period than ten months; and a large proportion of mothers and nurses require supplementary aid much sooner than this. In cases, therefore, of protracted lactation, the breast-milk is generally an insignificant portion of the total nourishment which is given to the child; and we can scarcely doubt that, under such circumstances, weaning might have long before been effected, in the interest of the infant, as well as in that of the mother. For while, on the one hand, a deteriorated lacteal secretion can scarcely fail to exercise a pernicious influence on the child; so, on the other hand, a long-continued drain on the system is seldom without its effect on the health of the nurse.

With a healthy and vigorous nurse, it is better that the child should have nothing but what she can afford it for the first six or seven months; and, certainly, the practice of feeding the infant during the night, so as to avoid trouble and disturbance to the mother, which has become too common of late, is one to which—save under exceptional circumstances—we should give no countenance. A partial failure in the quantity or quality of the milk may, no doubt, occur at a period very much earlier than that to which we refer; so that it may be absolutely necessary, even at the second or third month, partially to feed, while nursing is simultaneously going on. It is, in all cases, advisable to accustom the infant to other food before the breast-milk is withdrawn; otherwise, the process of weaning is much more troublesome, and is more likely to be productive of unsatisfactory results. When this is done, and when the proper time arrives, the quantity of milk should be gradually and steadily diminished, and the proportion of other nutriment correspondingly increased, until the latter alone remains. Seldom, however, is this effectual without more or less of trouble, arising from the restlessness which the deprivation of the milk excites in the child; but, if the weaning process has not been too abrupt, the screaming fits and other evidence of discomfort will not last beyond a couple of days. And, as regards the mother, any discomfort which she may experience may be easily kept within moderate bounds by saline laxatives, abstinence from fluids, and the application of belladonna or cooling lotions to the breast, until the gland ceases to discharge its function.

The general health of the child is the point which, above all others, is of importance in its bearing on the period to be selected for weaning. It is proper, therefore, to await the subsidence of any febrile attack, or even of an ordinary catarrh, or some other trifling ailment, before weaning the child; and it is, we may say, the universal practice to regulate the process, in some measure, by the progress of dentition, which is, as we shall see presently, almost invariably marked by stages, these being separated by intervals, during which such constitutional disturbance as may attend the eruption of the teeth completely disappears. It is well, therefore, to select the latter periods as those at which constitutional irritation is less likely to be engendered. There is, as we may well suppose, the greatest difference in the ease with which children are weaned—the deprivation causing, in one case, scarcely a gesture indicating uneasiness or discomfort, and, in another, a degree of fretfulness, and even of constitutional disturbance, which seems quite out of proportion to the cause. This depends, no doubt, upon the temperament, or, possibly, upon constitutional causes; but there is every reason to believe that the idea, which has so long obtained, in regard to the bearing which the progress of dentition should have on the question of weaning, is well founded, and ought, in all cases, to be admitted, as affording indications of no small importance. But to attempt to fix absolutely the period of weaning, as applicable to all cases, is as absurd in theory as it will be found to be unsatisfactory in practice, were it for no other reason than the well-known irregularity which attends dentition. In the case of a perfectly healthy infant, and an average result in the eruption of the teeth, we may, however, assume that ten months is a proper period for weaning, as at this time there is usually a pause in the process of dentition, subsequent to the appearance of the eight incisors.

Dentition.—Among the many reasons which indicate the necessity for a careful alimentation of the child during the early months of its existence, there is perhaps none of greater importance than that the system may be prepared for the contingencies which so often attend the iption of the teeth. From imperceptible constitutional disturbance, derangement of all the functions, and convulsions at the cutting of ery tooth,—which may be held as indicating the extremes,—cases er themselves under every conceivable grade of symptom intermediate tween the two. There are few more perfect illustrations of the deli-te sympathy which exists between functional disturbance and distal itation, than are afforded by watching the progress of the first den-ion. As a rule, indeed, the symptoms are merely those of local itation; but in a large proportion of all cases, the sympathy referred is evidenced by more or less of gastro-intestinal derangement, while, a considerable number of instances, a reflex irritation is manifested symptoms which indicate, more or less clearly, a disturbance of the rvous centres.

Although, as a general rule, the development of the milk teeth within jaw involves neither local nor constitutional disturbance, and it is ly as they are about to penetrate the gum that the symptoms to ich we have alluded first manifest themselves, the influence of the ocess is sometimes exhibited a considerable time before the teeth upon ich the phenomena depend make their appearance. So long as no nefaction, or other morbid condition of the gum is observable, our atment can only be expectant, or, at least, directed to the functions ich are disturbed; but this is clearly one of the conditions to which have already referred as indicating the necessity of caution in the tter of weaning,—for there can be little doubt that, in such cases, a ange, and especially a sudden change, in the nature of the food, is ry likely to be followed by an aggravation in the general symptoms. ch a state of matters is, in fact, sufficient warrant for protracting the riod of nursing until more favorable conditions manifest themselves, hich will generally be the case on the eruption of the first teeth.

Although the process is subject to many irregularities, the teeth nerally make their appearance in a certain order, as is represented in e following formula, where the figures indicate the month at which, mature and healthy children, we may expect the various teeth, the ntition usually commencing with the incisors of the lower jaw:

Molars.	Canine.	Incisors.	Canine.	Molars.
24 — 12	18	9 — 7 — 7 — 9	18	12 — 24

From this it appears that the milk-teeth—which are twenty in num-er—come through the gums in the following order. It is, of course, nderstood that an infant may be born with teeth, or may not have a oth until several months later than is indicated by the formula, and either case without a single special symptom. On an average, then, e central incisors make their appearance in the course of the seventh onth, and are followed, about the ninth, by the lateral incisors. After is, there is a pause of something like three months, which is the time enerally selected for weaning the child. In about three months more e first molars come to the surface; and, at intervals of six months, the canines and second molars respectively,—so that the dentition is usually completed about the end of the second year. If the delicacy of the child, on the one hand, or premature or irregular eruption of the groups of the teeth on the other, should disturb our calculations, it may be necessary to modify the ordinary routine procedure; and, in any case, the symptoms of irritation, local or general, to which reference has been made, and which indicate the approaching eruption of a tooth or group of teeth, should be held as warranting us in postponing the period for weaning.

A very limited experience in the treatment of the diseases of infancy is sufficient to show that the eruption of the deciduous teeth is intimately connected with many of the most important of these. It has, on this account, been admitted from time immemorial that the management of children during teething, is a point which often involves both responsibility and anxiety. It is, however, a matter which can admit of no doubt that a knowledge of this familiar fact leads in no small number of cases to illogical inferences and slovenly practice. Nothing can well be imagined more irrational than to suppose that all the ailments which may affect the child during the period of dentition depend upon local irritation, due to the impending eruption of the teeth; and it is scarcely less absurd to conclude that all irritation is to be relieved by the promiscuous use of the gum lancet. On the latter point, West well observes, that "such a proceeding is nothing better than a piece of barbarous empiricism, which causes the infant much pain, and is useless or mischievous in a dozen instances, for one in which it affords relief."

So long as the process of teething is going on quite naturally, or is only accompanied with restlessness or slight fever, the less we interfere the better. The progress of the tooth towards the surface is necessarily slow, but the manner in which the tissues of the gum which cover it are gradually attenuated, so as to admit of its final emergence, form no exception to the generally admirable manner in which nature discharges her manifold functions in the animal economy. And yet it is too much the fashion in many quarters to have recourse to the lancet, in a very large proportion of cases, its use being supposed to be indicated by any, even the most trivial, of the ailments of dentition. In certain cases it is admitted that the lancet is the proper and only treatment; but, the more carefully we watch the natural process, the more cautious do we become in resolving upon lancing the gums of an infant. The conditions which may be admitted as warranting the operation are mainly these: 1st. When the child is suffering, and the tooth is so nearly through that we are sure that cutting down upon it will at once relieve the tension, and permit of the passage of the tooth. 2d. When the gums are swollen, hot, and tender, and obviously more vascular than usual, but in this case we operate, not with the view of bringing the tooth through, but to give relief to local symptoms, upon which the constitutional disturbances may be supposed to depend; and 3d. The occurrence of convulsions during one of the periods of active dentition is generally, and with perfect propriety, looked upon as justifying us in using the lancet, even although the state of the gum may not seem to warrant the operation. This we do, less from a conviction that the procedure is likely to be efficacious, than in the hope that it may prove so. When a tumid state of the gum is associated with aphthæ, or with that severe variety of inflammation of the gum to which in infants the name of Odontitis has been given, the use of the lancet, far from being beneficial, only makes matters worse. And where, in the case of tense and swollen gums, it is employed, not for the purposes of scarification but in the expectation of bringing the tooth through, there is some reason to fear—and, indeed, this is a point which is very generally believed—that an incision of this kind results in a cicatrix, ultimately rendering the passage of the tooth through the gum more difficult than if we had left it untouched.

The mode of cutting the gum varies according to the nature of the tooth over which we are operating. In the case of the incisors, the incision should be longitudinal, and directly along the cutting edge of the tooth. As regards the molars, again, it is usual to make a crucial incision. While we are inclined to think that the idea of a cicatrix in the gum proving a serious obstacle has been in some degree exaggerated, we think that it is well to avoid, if this be practicable, the possibility of any such result. This may be done in a very simple way by so operating, when we cut or scarify the gums with the mere object of depletion, as to avoid that portion of the surface through which the tooth must ultimately pass. We have generally found that scarification practiced, not over the alveolar ridge, but near the base of that portion of the gum which is chiefly affected, has a perfectly satisfactory effect, and besides this will also be found in most cases to be attended with a more considerable flow of blood than when we proceed in the usual way. It often happens that the effect of scarification of the gums, although marked, is but temporary, and, on that account, it is frequently necessary to repeat the operation again and again, to subdue symptoms which are exceedingly apt to recur.

In the treatment of Odontitis, the lancet should be scrupulously avoided, as there is here a tendency to the formation of troublesome ulceration at the site of any incision or scarification which may be practiced. Our attention should, in such cases, be directed to the state of the digestive functions; and, by a careful regulation of the diet and otherwise—while the local affection is to be met by the application to the affected surface of a solution of borax, with or without the chlorate of potash—the symptoms will generally in some degree be controlled. The latter drug may also be given internally, in the manner suggested by Dr. Hunt, in doses of two grains every four hours.

CHAPTER XL.

PHLEGMASIA DOLENS.

THE PUERPERAL STATE IN ITS RELATION TO DISEASE—PHLEGMASIA DOLENS: NOMENCLATURE—CAUSES; AFTER LABOR, AND WHEN UNCONNECTED WITH DELIVERY—SYMPTOMS: PREMONITORY SIGNS: PAIN: WHITE SWELLING: TENSION: HEAT: CONSTITUTIONAL SYMPTOMS: THE LIMB PITS ON PRESSURE DURING CONVALESCENCE: LOSS OF POWER IN THE LIMB—MORBID ANATOMY: CHARACTER OF THE EFFUSED FLUID: PLUGGING OF THE VEINS: STATE OF THE LYMPHATICS—PATHOLOGY: MILK-LEG: ANGEIOLEUCITIS: CRURAL PHLEBITIS: EXPERIMENTS OF MACKENZIE AND H. LEE: VIEWS OF TILBURY FOX: REVIEW OF THE PATHOLOGY OF THE SUBJECT—TREATMENT: IS BLOODLETTING JUSTIFIABLE? BLISTERS: BANDAGING: IS CONTAGION POSSIBLE? GENERAL TREATMENT TO BE DIRECTED AS A RULE TO A CONDITION OF DEBILITY: TONIC REGIMEN: ANTISEPTIC REMEDIES—CAUSES OF PROTRACTED CONVALESCENCE.

PASSING now to the consideration of what are essentially Diseases of the Puerperal State, we observe that, apart from such affections as are assumed to belong to the condition referred to, there is ample evidence of a peculiar constitutional sensitiveness, one effect of which is to increase the gravity of symptoms arising from what, under other circumstances, we would call quite ordinary diseases. There is, in fact, no disease to which a recently delivered woman is not as liable as others; but in her case there is this special danger, that what we would call but a trivial ailment may, in consequence of the special conditions under which she is placed, be attended with symptoms of serious and alarming import. An ordinary catarrh, for example, may so disturb that repose of the functions, which seems to be a prominent characteristic of the puerperal state, that an amount of constitutional disturbance is produced out of all proportion to the essential nature of the disorder. A state which is naturally one of calm quiescence is changed to a condition in which a turbulent circulation, arrested secretions, and violent fever, give no small cause for anxiety; and it is on this account that we so carefully guard against the occurrence of such influences as may change the case at once from a favorable into an unfavorable category. All ordinary diseases, then, which are accompanied with what are called febrile symptoms, are looked upon with considerable apprehension, as they are apt to be accompanied, in the special cases in question, with a train of supernumerary symptoms which are held as characteristic of the puerperal state.

It is, perhaps, in a sense, not too much to assume, that what are called the diseases of the puerperal state are merely more marked illustrations of the condition to which we refer. The peritonitis, the metritis, the mania of a puerperal patient, are thus nothing more than familiar diseases modified by special conditions, one of which is what we have ventured to call, for lack of a better name, a peculiar constitutional sensitiveness. We are amply warranted, however, as the sequel will show, in considering each of these affections with reference to the period succeeding delivery; and we shall find, that, not only are the symptoms modified, but they are so to such an extent as to require, in many cases, a treatment quite different from that which is supposed to be applicable to the disease in its ordinary form.

Phlegmasia Dolens, or Phlegmasia Alba Dolens—the disorder which forms the subject of this chapter—forms no exception to the rule just stated. It is, indeed, more strictly a disease of the puerperal state than many of the affections which we shall have to consider, inasmuch as it is seldom observed save as associated with recent delivery. That the puerperal state is not, however, essential to its manifestation is universally admitted, as it has not unfrequently been met with in women who have never been pregnant, and even in persons of the opposite sex. Few diseases have had a greater variety of designations applied to it than this; *anasarca serosa*, *phlegmasia lactea*, *œdema lacteum*, *white leg*, and *crural phlebitis*, being but a few of the many appellations under which it has been described, a study of which, indeed, is not uninstructive, as it almost gives an epitome of the various pathological theories which have been successively advanced to account for the somewhat peculiar phenomena of the disease. Excluding the very few cases in which it, or a precisely similar condition, has been observed to attack the arm, phlegmasia dolens consists in a white painful swelling of the leg. Although, as we have said, it is not necessarily associated with the puerperal state, it is almost always observed in women who have been recently confined, the period of its occurrence varying from the fifth to the thirtieth day, and, in very exceptional cases, at an earlier or later date than the extremes mentioned. It is more common in pluriparæ than in primiparæ, and is more likely to occur in women who are of a feeble and delicate constitution than in those who are robust. In a very considerable number of cases, it has followed the various accidents and complications of delivery, and has even been noticed to occur more frequently after removal of a retained placenta. All English writers on the subject agree in asserting that it usually attacks the left in preference to the right leg, which Mr. White of Manchester seemed to think was due to the fact of women in this country habitually lying on the left side during labor; while Dr. Ramsbotham supposed that it "may possibly, in some inexplicable manner, be dependent on the different distribution of the right and left spermatic vein—the right terminating direct in the vena cava, the left in the renal."

In no class of cases has it been so frequently observed as in women whose strength has been reduced to a low ebb by hemorrhage either during or after labor; and this, no doubt, accounts for the observation made by Merriman that it is relatively of common occurrence after placenta prævia. Women who have once suffered from phlegmasia dolens are by no means so liable to it in subsequent pregnancies as we might perhaps be disposed to anticipate; and it has generally been observed that when it does so recur, the subsequent attacks are much less violent. Mr. White says that he never knew it happen to a woman more than once; but this does not tally with the experience of most modern practitioners. One very troublesome and annoying peculiarity of this affection, is the tendency, exhibited unfortunately in a considerable proportion of cases, which the disease has, after having partially run its course in one leg, to be transferred to the other, and there pass through the same tedious stages, still further reducing the strength of the woman, and postponing the period of her convalescence—it may be by several months.

It may be interesting here to mention the circumstances under which phlegmasia dolens has been observed when unconnected with recent delivery. Puzos and, since his time, many modern writers have recorded cases in which all the usual phenomena have been manifested in the course of pregnancy. In a more considerable number of instances, it has been observed as occurring after abortion, particularly in cases in which the placenta or any other portion of the ovum has been left behind. It has also been found to occur after the removal of polypi, the enucleation of fibrous tumors, and the operation of lithotomy. In another class of cases, to adopt the classification of Dr. Tilbury Fox, it may be met with as part of a *general* disease. Under this head he includes those instances in which it has been developed as one of the distressing phenomena of puerperal fever; and, occasionally, in cases of ordinary continued fever, a similar complication has been found to arise. With this variety are ranged three cases in which it was observed to coexist with dysentery, erysipelas, phthisis, and what Dr. Humphry described as a "preternatural coagulability of the fibrin of the blood." A considerable number of instances have been recorded in which the disease has been associated with malignant growths, not in the pelvic region merely, which we could more readily understand, but as affecting distant organs, such as the stomach or the mammary gland. In a third class of cases, still observing the classification of Dr. Fox, phlegmasia dolens is met with as complicating other *local* diseases; and under this head are ranged, and all on sufficient authority, examples of iliac abscess, suppressed menstruation, hæmorrhoids, hepatic disease, and dislocation of the shoulder. These exceptional cases have, as we shall find, an obvious and important bearing on the hitherto obscure pathology of the affection.

Symptoms.—As in most other diseases the violence and typical distinctness of the symptoms of phlegmasia dolens vary considerably; and in some cases they are so feebly marked that we have difficulty in determining whether the case should be classified under this head or should be considered as a simple case of œdema. In an ordinary case the symptoms may either come on suddenly, when they are often ushered in by a rigor of some severity, or they may manifest themselves more insidiously, when certain premonitory signs are frequently noticed. These are generally—in the puerperal variety, to which we shall in future exclusively refer—a feeling of weight and discomfort in the hypogaster, extending round the brim of the pelvis, which is soon replaced by actual pain, accompanied with more or less of constitutional disturbance. The pain is commonly referred more particularly to the inguinal region on the side which is about to become the seat of the disorder. We have more than once noticed that pain is complained of in the region of the hip-joint; but as this is not mentioned by other writers on the subject, we infer that the occurrence is exceptional. Dr. Denman describes, as a premonitory symptom, that "before the appearance of any swelling, or sense of pain in the limb about to be affected, women become very irritable, with a sense of great weakness, and grievously oppressed in their spirits, without any apparently sufficient reason; complaining only of transient pains in the region of the uterus, and from these the approach of the disease has frequently been foretold." The pain commencing, as has been described, in the inguinal or pelvic region, extends downwards, and as the various districts of the thigh and leg become successively invaded by it, the swelling of the limb steadily advances in the same direction, until, at the height of the disease, the whole limb presents the white, glazed, and sometimes enormously swollen condition which is so eminently characteristic. This is further accompanied by a complete loss of power, the patient being quite unable to move the limb, or indeed to change her position in bed without assistance. The tissues are tense and elastic, but, although they yield before the finger, they do not pit on pressure after the swelling has assumed its characteristic appearance. The temperature of the limb is usually increased.

Notwithstanding the great swelling of the limb, the veins can generally be distinctly felt, hard and rolling under the finger like a thick cord. This is more particularly the case in regard to the femoral vein, which may often be traced from the groin downwards, although the pressure gives rise to considerable pain. The swelling in some cases extends to the hip and vulva. The glands of the groin participate in the irritation, and sometimes become affected with well-marked inflammatory action, although they very rarely suppurate. The action obviously extends to the lymphatics, and sometimes the only appearance which varies the surface of the white limb is a faint red streak here and there indicating the situation of the affected vessels. A similar appearance, which, in this case, is more diffused, has also been observed over the course of the venous trunks. It was first remarked by Dr. Stokes—an observation which has been corroborated by Dr. Churchill—that the amount of the swelling is no proof of the severity of the disease; but that, on the contrary, "the severity of the constitutional symptoms is often inversely as the swelling of the limb."

In a certain number of cases the symptoms run a somewhat different course. Obviously, in the instances referred to, the disease does not originate in the pelvis, and is ushered in by no such preliminary pelvic symptoms as have been described above. "Sometimes," says Burns, "there is no uneasiness in the belly, and the first symptom is sudden pain in the calf of the leg. Within twenty-four hours after the pain is felt, the limb swells, and becomes tense; it is hot, but not red—it is rather pale, and somewhat shining." It is a matter of considerable importance that the peculiarities of this variety, which is by no means uncommon, should be borne in mind, for otherwise the idea of "crural phlebitis," which is very commonly supposed to express the pathology of the disease, might altogether divert our attention from symptoms which are nevertheless identical in all important particulars with those which are truly characteristic of phlegmasia dolens, the only difference being that, in the cases which we are here considering, the disease begins below and thence extends upwards.

The constitutional symptoms are just such as one might anticipate from a local affection of such importance. The lochial and lacteal secretions are either arrested or modified, and in the case of the former, the discharge sometimes becomes offensive. The degree of the fever is indicated by the frequency of the pulse, which is seldom under 120. The complete loss of appetite, the furred tongue, and the state of the evacuations, all show how much the gastro-intestinal functions are disturbed. The patient is restless, sleepless, and complains much of thirst.

After a time, which varies much in different cases, all the symptoms undergo an improvement. The fall of the pulse, and the subsidence generally of the constitutional symptoms, are accompanied both by relief of pain and a diminution in the swelling of the leg. A remarkable change now takes place in the character of the swelling, as it is no longer elastic and resistant, but pits on pressure like ordinary œdema; and this change is sometimes observable before there is any very marked difference in the size of the leg. The loss of power in the limb, most marked in cases where the swelling has commenced at the groin, is often very persistent, and is one of the last symptoms to yield. We may expect, therefore, occasionally to meet with cases in which, in the absence of all evidence of constitutional disturbance and apparently of local change, this paralyzed condition of the leg remains for months and even for years. In some cases of exceptionally long continuance of immobility, there remains a permanently thickened condition of the tissues, which may somewhat increase the circumference of the limb. In most cases, the ordinary sensibility of the leg is affected for a considerable time, and the patients often complain of what Dr. Churchill graphically describes as a *wooden* feel, which may persist in a degree for a long period. A varicose condition of the veins has been sometimes observed after phlegmasia dolens, which has been supposed by some to be due to a special morbid condition.

But, while the great majority of cases thus end in resolution, and ultimately in satisfactory although possibly tardy convalescence, it is not always so. For, in a few, suppuration occurs, in the limb itself, in the inguinal glands, or within the pelvis, in which latter case it may be difficult to say which is the primary and which the secondary disorder. As the result of such suppuration, and, in some very rare instances, of gangrene, the exhaustion is so great that the patient succumbs, but so uncommon is such an event that the opportunities which have been afforded for the examination of the white leg after death are extremely rare. Let us see, however, what are the facts which morbid anatomy has disclosed.

"On opening the limb," says Churchill, "it is found to be extended with serum, effused into the cellular membrane." This assertion is no doubt correct, but it is incomplete, and being so is apt to lead to an erroneous assumption. The words quoted will serve equally well for the description of what is observed when we cut into a part distended by ordinary œdema; but the symptoms already detailed show one thing at least very clearly, that phlegmasia dolens is something essentially different from œdema. It has been found, moreover, that the fluid which exudes in the latter condition is watery in its nature; but carefully observed facts have shown that the limb, and especially the fibro-cellular and cutaneous tissues, are distended in phlegmasia dolens, with a peculiar serosity which is more or less coagulable. Again, thrombus or plugging of the venous trunks of the limb, usually in the neighborhood of the groin, has been so constantly observed that it may be assumed as a phenomenon essential to the disease. This may exist with or without inflammation of the coats of the vessels. And, further, the great majority of observers have noted that the lymphatics are also affected, their main trunks and more important glands often yielding evidence of inflammatory action, which in the latter situation has occasionally gone on to suppuration.

Pathology.—The symptoms, morbid appearances, and even the varieties in nomenclature, all strongly point to one conclusion,—that the pathology of this disease has given rise to many differences of opinion, is in itself peculiar and perplexing, and remains, even at the present time, still somewhat obscure. It was at one time generally believed that the "white leg" was due to the presence of milk in the limb, and the idea was so far favored by the fact, that in most cases the lacteal secretion disappears. It is, however, somewhat surprising to find Puzos and Levret giving their countenance to an idea so absurd; for, although pathology in their days was still in its infancy, their assumption was far less advanced than the views of Mauriceau, who held, at a period seventy years earlier, an opinion which, indeed, comes pretty near some quite modern doctrines, when he describes the accident as one "which often succeeds pain in the ischiadic region, and is caused by a reflux, —which takes place on those parts,—of the humors which ought to be evacuated by the lochia." The believers in this theory of a metastasis of the milk recommended that the child should be kept constantly to the breast.

Towards the end of the last century, the subject attracted considerable attention in this country. Mr. White of Manchester then advanced the theory that the disease depended on obstruction, or on some other morbid condition of the lymphatic vessels and glands of the affected part; and subsequent writers suggested rupture of the lymphatic vessels, or an inflammatory condition of the same parts, as the morbid condition to which the familiar phenomena of the disease were, at least primarily, to be attributed. The opinion adopted by Dr. Hull was, that phlegmasia dolens consists "in an inflammation of the muscles, cellular membrane, and inferior surface of the cutis, extending, in some cases, perhaps, to the large bloodvessels, nerves, lymphatics, and glands." This, which was sarcastically called by Davis, "Dr. Hull's *capacious* theory," indicates a belief that the disease is due to inflammatory action, but it otherwise throws no light upon the subject. Up to this time, no suspicion seems to have been entertained as to the part which the veins take in the production of the symptoms. The priority of publication on this subject is due to M. Bouillard, who, about the end of 1822, related several cases and dissections,—which were shortly afterwards published in the "Archives Générales,"—in which the crural vein was obliterated, and in regard to which he expressed a belief that the peculiar symptoms of this disease were due to obstruction of the venous trunks. Several years before this, the attention of Dr. Davis had been particularly attracted to this subject, in consequence of the death of a patient of his from phlegmasia dolens, but his essay was not published till some months after the date of M. Bouillard's communication.

In the case in question, a very careful dissection was made by Dr. Davis, assisted by Mr. Lawrence, in the course of which it was demonstrated that "the femoral veins, from the ham upwards, the external iliac, and the common iliac vein as far as the junction of the latter with the corresponding trunk of the right side, were distended and firmly plugged with what appeared a coagulum of blood. The femoral portion of the vein, slightly thickened in its coats, and of a deep red color, was filled with a firm bloody coagulum, adhering to the sides of the tube. The trunk of the profunda was distended in the same way as that of the femoral vein; but the saphena and its branches were empty and healthy." Ultimately, Dr. Davis advanced the theory that phlegmasia dolens is essentially *Crural Phlebitis*, and under this name, as a synonym, the affection is still described by most English writers.

Although for a time the authority of Dr. Davis, supported by the corroborative testimony of Dr. Robert Lee and others, seems to have checked further inquiry, and to have resulted in a general belief, that what had been for so long a physiological problem was at last solved, many of the best pathologists were still dissatisfied with the phlebitic theory, and we believe with good reason. Virchow was one of the first to point out—what has since received ample corroboration—that, in phlegmasia dolens, inflammatory changes in the vessels may be altogether absent. In other words, thrombus is not necessarily preceded, although it may be followed, by inflammation of the coats of the vein where the obstruction has taken place. In this country, Dr. Mackenzie took a prominent part in opposition to the views which were generally admitted. In the course of a very painstaking investigation of the subject, conducted, to a great extent, in the form of experiments on the lower animals, the inferences which he ultimately drew from his labors were as follows: "1. That inflammation of neither the iliac nor femoral veins would account for, or give rise to, phlegmasia dolens; 2. That the extensive obstruction of the veins met with in this disease is not producible by merely local causes, such as injury or inflammation of these vessels; 3. That irritation of the lining membrane of the veins, independently of such local injury or inflammation, will only give rise to obstruction of these vessels, to an extent commensurate with that of the irritation which may have been excited within them; 4. That extensive irritation of the lining membrane of veins, giving rise to obstruction and all the phenomena of phlebitis, may be excited by the presence of various unhealthy matters in the blood circulating with this fluid, and determined upon particular portions of the venous system; 5. That the origin of the disease is therefore to be sought for rather in a vitiation of the circulating fluid than in any local injury, inflammation, or disease of the veins."

Mr. H. Lee also performed a series of experiments conducted on a somewhat similar principle. His observations were meant to show, and, in point of fact, did clearly show, that it is by no means an easy matter to excite inflammatory action in the lining membrane of veins, even although irritant or septic substances be introduced into the veins and brought directly into contact with their lining membrane. These results are in perfect harmony with those which, quite independently, were obtained by Dr. Mackenzie. Experiments were also devised by the latter with the view of determining the effect of irritation on the external coats of the vessels; and, although he injured and irritated their coats in various ways so as to excite localized inflammatory action, he found that such inflammation showed little tendency to spread, and that the lining membrane remained free from any effect arising from the irritation applied to the external parts of the vessel. Dr. Mackenzie quite admits that coagulation of the blood contained in a vein is one of the phenomena of true phlebitis; but he insists, and, we think, proves, that changes in the blood, due to septic action, may produce a thrombus with equal certainty. The effect of an admixture of pus in precipitating the fibrin is clearly demonstrated in the following experiment, which is one of those performed by Mr. H. Lee: "Some blood was drawn from a healthy horse and poured into three vessels capable of containing three ounces each. The blood in the first vessel was allowed to remain as a standard of comparison. To that in the second vessel was added some viscid matter from an indolent tumor in the horse's neck; to that in the third, some pus from a chronic abscess. The contents of the third vessel (blood and pus) began to coagulate in three minutes; the mass was firm in four. In eight minutes the contents of the first and second vessel had become firm."

Dr. Tilbury Fox, in two very able papers, communicated to the Obstetrical Society of London in 1861, and published in their Transactions for that year, enters very fully into the subject, and strongly opposes the view that phlebitis is an essential phenomenon of phlegmasia dolens. His leading idea is, that the cause of the peculiar phenomenon of white leg "is an impediment to the return of blood *and lymph* from the affected part;" and he goes on further to observe, "that the causes of such impediment may be, so far as regards the vessels, *extrinsic* and *intrinsic*." The extrinsic causes comprise all cases of pressure on the vessels from tumors, abscess, &c. The intrinsic causes, again, are all assumed to produce coagulation, and the more important of these are: 1. Phlebitis, septic or non-septic; 2. Introduction of morbid matter into the vein, producing simple thrombus, but not phlebitis; 3. Preternatural coagulability of the fibrin of the blood, as assumed, and, in a manner, proved by Drs. Humphry and Graily Hewitt. While not denying the possibility of crural phlebitis being associated with, or even preceding the phenomena of phlegmasia dolens, Dr. Fox argues with much force and ability in favor of the conclusion that a septic action proceeding from the denuded inner surface of the uterus is the most probable cause of the disease. With reference to this he writes as follows:

"It can in no wise be denied that the parturient woman is a subject apt for the occurrence of thrombus; there is hyperinosis, the uterus offers a denuded stop, its veins are thin, osmosis is easy, the lymphatic act and circulation are active in removing the disintegrating uterus in conjunction with the veins, &c. These constitute an analogous condition to that stage in which phlegmasia dolens is wont to occur elsewhere, —I mean the ulcerative stage and kind of disease, *e. g.*, dysentery, cancer, phthisis,—so much so that we should not expect it to occur when wound is absent, except from extrinsic pressure. This close relation of wound in the one case,—phlegmasia dolens,—and the absence of it in the other,—œdema,—is a contrasting difference in the pathology of the two states; in other words, where wound is, the lymphatics are involved. Now for the culminating point,—the cause of the rapid absorption. I have been particularly struck, in the cases that have come under my notice from the outset, by the occurrence of notable hemorrhage, or profuse discharge of other kind, and I find, from close inquiry, that the reminiscence of the practice of others well able and qualified to give an estimation of the point, affords the like result. I have been desirous for some time to ascertain if there be any relation between the two phenomena—discharge and phlegmasia dolens. My belief is, that the cases which cannot be accounted for by the existence of phlebitis, or pressure, are due to simple coagulation, the result of tolerably rapid absorption of morbid fluid; this excess of absorption, over and above what is natural, being induced by the occurrence of notable sudden discharge,—the latter being the culminating point in the causation. We do find present facility for rapid absorption, wound, and morbid fluid, in the cases in which phlegmasia dolens, of the type under discussion, occurs. Of course, this is at issue with Dr. Humphry, who, in his recent pamphlet, says that there certainly seems no reason to attribute the affection to an introduction of pus, or other morbid fluid, into the circulation."[1]

Dr. Fox sums up his conclusions, with reference to the disease under consideration, as follows: "Prop. I. In phlegmasia dolens both veins and lymphatics are obstructed. Prop. II. The obstruction may be due simply to extrinsic pressure. Prop. III. Or to inflammatory changes in the coats of the vessels, leading to coagulation. (This depends upon virus action.) Except during epidemics of puerperal fever, this is not so common as supposed. Prop. IV. It is pretty well admitted that rapid ingress of abnormal fluid, suddenly, and in large amount, will cause instantaneous coagulation of the blood; and it is also admitted that large drains from the system are followed by rapid and compensating absorption. There is good reason for believing that these conditions are fulfilled, in a perfect and ample degree, in conjunction with the presence of wound,—facilitating absorption,—in a great many cases prior to the occurrence of phlegmasia dolens, and that the latter is frequently thus evolved. Prop. V. These different modes of evolution may be more or less conjoined."

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[1] Transactions of the Obstetrical Society of London. 1861.

On a review of the whole subject, and setting aside such of the older theories as are clearly incompatible with the possibilities of modern pathology, we cannot but admit that phlegmasia dolens is still a matter in regard to which we have much to learn. That obstruction of the venous trunks, from whatever cause arising, is essential, we do not question; but it is clear that this will not account for the phenomena which we observe, since the symptom which, above all others, is held to be indicative of an obstruction to the venous return,—œdema, to wit,—is, during the active stage of the disease, absent. Nor do we believe that the simple theory of phlebitis can be accepted as a solution of the problem, in so far, at least, as this may be considered the proximate cause of the disease. No one can dispute that phlebitis causes coagulation of the blood contained in the affected vein. In those cases of phlegmasia dolens in which the affection has been associated with the more serious varieties of puerperal fever, clear evidence of inflammation of the coats of the veins has been observed; and the theory referred to has received still further corroboration from the observation of Dr. Robert Lee, who traced such venous inflammation to its most probable source, in the uterine branches of the hypogastric vein.

But, on the other hand, it has been satisfactorily demonstrated, both by Dr. Mackenzie and by Mr. H. Lee, that the veins, and especially their lining membrane, are singularly averse to taking on inflammatory action; and it has also been shown, with almost equal certainty, that the deeper color of the membrane referred to is not a necessary indication of inflammation, but is due rather to the action of the coloring matter and the contact of the clot. But were we even to admit that phlebitis is an essential part of the disease now under discussion, there is no sufficient evidence that the one condition depends upon the other. If we study the description given by surgical pathologists of the affection known as "fibrinous phlebitis," with which alone phlegmasia dolens can fairly be compared, we find that, among the more important of the symptoms which are detailed, swelling of the limb below the affected part and œdema of the surrounding cellular tissues are among those which are most prominently put forward. In no single case, so far as we know, since M. Breschet first demonstrated and named the affection, has phlebitis been described as involving, in the case of a limb, the white, elastic, painful, and benumbed condition which is so diagnostic of the other disease. We do not hesitate, therefore, to reject the term "crural phlebitis" as synonymous with phlegmasia dolens.

While giving every weight to the authority of such names as Denman, Caspar, and Dewees, we confess that the theory with which their names are associated is even less satisfactory than the other, for were we to admit that angeioleucitis may account for the appearance and character of the swelling, this affords no explanation whatever of the fact that the veins are plugged with clots. We may, indeed, be perfectly sure that to them the fact last mentioned was unknown, for had it been brought under their knowledge it could scarcely have failed to prove to them that, even if, as Denman said, "the glands and lymphatics of the limb were evidently the parts first and primarily affected," there was something more than this necessary to account for the phenomena ordinarily observed in these cases. What has already been explained in reference to the symptoms of the disease, and the attendant morbid conditions, certainly proves that, in some cases at least, the vessels and glands of the lymphatic system are involved; but probably no one will now attempt to maintain that an inflammation of these structures will, if uncomplicated, account for the white leg of the puerperal state.

On the whole evidence we are inclined to the belief, while giving expression to it with some hesitation, that the first crude theory of Mauriceau points significantly in the direction to which we may most confidently look for a solution of the difficulties which beset the subject. We do not of course mean that his quaint idea of a "reflux of humors" from the womb upon the limb was, in the sense which he attached to the expression, a pathological speculation which modern experience could justify; but rather that, in thus pointing out a possible connection between a local lesion and a septic action, starting as in other analogous cases from the wound, he indicated, in a striking manner, the direction in which we should seek for a solution of the problem. There is abundant evidence to prove that septic agents of various kinds may cause coagulation of the blood. The experiments of Mr. H. Lee, already alluded to, showed that pus produced this effect. Dr. Mackenzie ligatured the left femoral vein of a dog, and injected half an ounce of a solution containing lactic acid. The animal died in half an hour, and on examination it was found that "the iliac veins on the left side from the femoral up to the cava, and a considerable extent of the cava, were obstructed by what appeared to be a firm coagulum; and on opening these vessels this was found to be closely adherent to their lining membrane." An exceedingly interesting case, bearing on the same point, is given by Dr. Tilbury Fox, of a lad aged twelve years, who, being bitten in the thumb by an adder, presented next day "a perfect and complete specimen of phlegmasia dolens" in the affected limb, so that we may assume that coagulation had been at least one of the results of the poison which was introduced in the manner described.

On the whole, therefore, we think that the preponderance of evidence is in favor of the idea that, in most cases of phlegmasia dolens, there is a precipitation of the fibrin by the action of some septic agent which has made its way into the blood, or has been developed in that medium. In this sense, Virchow's theory, "that the first pathological condition is the formation of a clot in the vein," may be accepted as highly probable. Certainly this is more likely than that true phlebitis is essentially the proximate cause, although no one can dispute either that phlebitis may cause coagulation, or that inflammation of the vein-tissues may accompany the other and more essential phenomena of phlegmasia dolens. It may obviously, and with perfect propriety, be urged against this theory that a septic action, having its origin in a wound, cannot apply to those cases in which the symptoms of undoubted phlegmasia dolens manifest themselves unconnected with the pregnant state. But we cannot see that this must necessarily be admitted as a serious difficulty; for if the proximate cause of the disease is assumed to be a septic action proceeding, in a great majority of cases, from the recently denuded uterine surface, it is surely not too much to assume that, in exceptional cases, the septic action which leads to coagulation may proceed from intrinsic causes, or even from poison introduced in some other way from without, as in Dr. Tilbury Fox's case above alluded to.

It is, however, scarcely possible to avoid the conclusion that a septic action and the resulting coagulation cannot satisfactorily account for all the phenomena of the disease. All that is necessarily involved in such an hypothesis is mechanical obstruction in a venous trunk, from which we could only anticipate œdema as a direct result. To the development, therefore, of the white elastic swelling something more is required; and this forces upon our notice the inquiry as to what are the auxiliary or supplementary conditions referred to.

No modern writer on the subject ventures to advocate the theory, which at one time had the support of the most distinguished obstetricians of the age, that the seat of the disease is essentially in the absorbent or lymphatic system. The facts demonstrated with reference to the veins preclude such a belief. But it by no means follows that the absorbent system takes no share in the development of the symptoms alluded to. The red streaks occasionally observed over the course of the larger lymphatic vessels, and the exceptional occurrence of inflammation and suppuration in the glands, prove quite clearly that they may be involved. But there are other considerations which seem to indicate something more than this, and that an affection of the lymphatics is an essential, although, probably, a secondary part of a typical case of phlegmasia dolens. If we assume, as some of the most distinguished of modern pathologists have done, that the lymphatic system affords the channel through which fibrin is introduced into the blood, we can readily understand why an obstruction in the vessels of that system, whether inflammatory in its nature or purely mechanical, may cause many of the essential phenomena of the disease. Plugging of a venous trunk could but cause œdema; but venous obstruction, *plus* an impediment to the circulation in the lymphatic system, may very readily be assumed to cause symptoms very like those which we have already described. "If there be any relation," says Dr. Fox, "between the lymphatic fibrin and the cellular tissue, it is easy to understand how obliteration of the lymphatics may give rise to the peculiar character of phlegmasia dolens, on account of the retention of the fibrinous material in the tissues,—the cellular especially, which is so rich in lymphatics. . . . The cellular tissue itself seems to be hypertrophied, the lymph also gelatinizing in its interstices."

The marked loss of power in the affected limb, out of all proportion to the mere amount of swelling, and which is, as we have seen, frequently of long continuance, seems, at one time, to have led to the idea that the nerves were primarily involved; and M. Dugès has certainly shown that, in some cases at least, inflammation of the nerves and of their sheath occurs. It seems to us, however, that serious lesion of the nervous trunks is, even from a purely theoretical point of view, by no means necessary to the temporary paralysis so characteristic of the disease. All, in fact, that is necessary to the arrestment of the nervine functions is pressure; and, in the condition to which the parts are reduced in the rapid development of a tense swelling, we may be sure that the nerves can scarcely escape such pressure as may produce the effect to which we refer.

The confusion which has so long prevailed in regard to the pathology of phlegmasia dolens seems to have been due, in a considerable degree, to the obstinacy with which pathological theories were pinned to affections of individual tissues or textures. No such theory can, as it seems to us, satisfactorily account for what, in these cases, we observe. It is, no doubt, of great interest to determine, if we can, what part or parts of the animal economy are primarily involved; but we may be quite sure that, if we take up any exclusive theory, as to the disease being one of a single fluid or a single texture, we pass into a field of speculation which is little likely to lead us to the truth. Doubtful though many points in regard to its pathology may be, we have no difficulty in refusing to admit of Crural Phlebitis, or Angeioleucitis, as terms which represent the true nature of phlegmasia dolens. Either of these conditions may, no doubt, exist, but if it be so they are secondary rather than essential. Thrombus, or obstruction otherwise to the venous return is apparently essential; and, in so far as the absorbents are concerned, it is possible that Dr. Tilbury Fox is correct in assuming that a similar obstruction is produced in them. But, as regards the latter, no plugging of lymphatic trunks has ever, in so far as we are aware, been demonstrated. Nor do we believe that it has been established that the disease is inflammatory in its origin, nor even that the inflammatory process is, at any stage, an essential pathological condition. On the contrary, we think that we perceive in the narrative of post-mortem appearances in fatal cases, another, and a very obvious source of error. That morbid appearances indicating inflammatory action have been frequently observed after death, we can well believe; but we must bear in mind that fatal cases are rare, and that, in ordinary cases, even when severe, there is rarely evidence, during life, of any such action. We demur, therefore, to the conclusion, that in the morbid phenomena of exceptionally severe cases, we have a demonstration of the essential features of what we have called an ordinary or typical case. Inflammation, in fact, we take to be, whether it is observable in the veins, the absorbents, or the contiguous tissues, an exceptional and essentially a secondary occurrence.

Treatment.—The fact that phlegmasia dolens follows in so large a proportion of cases upon a condition of debility and exhaustion, usually produced by hemorrhage, shows pretty clearly that the case is not one for an antiphlogistic regimen. This may be conceded even by those who believe most implicitly in the inflammatory nature of the disease; and the opinion must necessarily gain strength if we assume that a septic action proceeding from, or associated with constitutional exhaustion, is an essential part of the disease. A belief in the inflammatory theory has not unnaturally led to a very general impression that bloodletting should usually be adopted. Few persons in the present day would probably think of general bloodletting, but it is commonly taught that leeches should be applied over the course of the affected vein; and, indeed, the rules for treatment which are laid down by many writers on the subject are such as to convey the impression that leeches are applicable to all cases. Such an idea is, of course, at variance with the view which we have expressed as to the nature of the disease, and cannot, certainly, be admitted as a safe guide to judicious treatment. The cases, in fact, to which the application of leeches is advisable are those only in which there is evidence of a local inflammatory action, which may very readily be induced under such circumstances, either in the lymphatics or in some other of the tissues of the limb. But even a clear indication of true inflammation does not necessarily warrant depletion, for we must first—and this is the most important point of all—be sure that the affection has not sprung from debilitating causes, for if it be so, to bleed is simply to encourage exhaustion, and to facilitate the absorption of septic materials. Bloodletting, then, we believe to be applicable to that comparatively rare class of cases only, in which inflammation exists in the absence of constitutional exhaustion.

Considerable benefit appears to have been derived in many instances from the application of blisters to the leg. Some have gone so far as to say that, in the treatment of this disease, blisters are to be regarded as specifics, but this is evidently a pardonable exaggeration. They may be applied, as we believe, with a reasonable prospect of success, in cases where there is inflammation, and where the general condition of the patient prevents us from having recourse to bloodletting; and there is certainly one effect upon which we may count with some confidence—that being a cessation, or at least an alleviation, of the pain which is so characteristic a feature of the more severe examples of the disease. Otherwise, the only effect which is likely to be derived from this method of treatment differs in no respect from that which, under similar conditions, we anticipate from the action of counter-irritation of any kind. Probably Dr. Churchill is quite correct when he says that although his own experience is decidedly in favor of the utility of blisters, "in many cases turpentine fomentations will answer equally well."

Bandages, if judiciously employed, are extremely useful in the cure of phlegmasia dolens. To the early stage, while the swelling is rapidly being developed, firm bandaging is for obvious reasons inapplicable, and might very possibly be attended with further arrest of the circulation, and sloughing similar to what has occasionally occurred from careless or unskilful bandaging in surgical practice. What is at this period safer and more judicious is to swathe the limb in fomentations, which, if the pain be severe, may be sprinkled with laudanum. On the subsidence of the more acute symptoms, bandaging may always be resorted to, at first with flannel and subsequently with an ordinary roller bandage. What may be safely held as indicating the period at which bandaging is proper, is when the limb pits on pressure, this pitting being probably impossible until the permeability at least of the lymphatic trunks has been restored.

Certain facts which have been observed with reference to the progress of these cases have suggested a suspicion that, in its more severe varieties, or, it may be, under exceptional circumstances, the affection may be propagated by contagion. That it may be so, when associated with the more serious phenomena of puerperal fever, we can readily believe; but we do not think that there is any evidence which would lead us to suppose that an ordinary case is thus communicable. The assertion has, however, been made upon high authority, and it will thus be well, even should the precaution be deemed superfluous, to take such means as may render any propagation of the disorder in this manner as little likely to occur as may be possible.

From what has already been said, it may be inferred that the constitutional treatment applicable to phlegmasia dolens is to be adapted far more frequently to a state of general debility than to a sthenic condition requiring antiphlogistic remedies. We speak, of course, of such cases as present the features of an ordinary puerperal case; but we do not mean to deny that exceptional treatment may be absolutely requisite to the proper management of particular cases, where marked local inflammation and accompanying fever of the sthenic type may call for prompt and energetic action. The state of the bowels must be carefully attended to, and, although it will rarely be advisable to give strong purgatives, it is almost always necessary to regulate the discharges by gentle laxatives or enemata, and to maintain them otherwise in a healthy condition. Should the lochia become in any degree offensive, simple tepid injections may be thrown into the vagina once or twice a day in the usual way. From a very early period of the case, the diet must be generous, and it will often be deemed expedient to give beef tea or stronger soups, and even wine from the first. During the period of convalescence, a similar method of treatment must be persevered in.

A tonic regimen being thus clearly indicated, it is often found necessary to administer iron, quinine, and other tonics. Dr. Mackenzie, with the view of neutralizing any septic materials which may exist in the blood, recommends the administration, either of hydrochloric acid, or of the sesquicarbonate of ammonia in full, concentrated, and frequently repeated doses. He directs that "an ounce of hydrochloric acid should be taken daily in a quart of barley or plain water, sweetened with syrup of ginger, and flavored with lemon-peel."

It is by no means a rare occurrence, that, in cases of this affection, quite unconnected with pelvic abscess or any other secondary affection, convalescence is extremely protracted. This, no doubt, depends chiefly, and in many cases entirely, on the effect which has been produced upon the nerves, resulting, in extreme cases, in actual paralysis of the limb. To the treatment of this condition, stimulating frictions are suitable, and it has also been recommended that, at this stage, a succession of small blisters be applied over the limb at various parts. Nothing is better, in such cases, than tepid sea-bathing, and especially the salt-water douche, followed by friction of the parts. There is good reason to believe that in some instances of slow recovery, this is due to the permanent plugging of the venous trunks, or possibly to their obliteration as the result of inflammatory action. In this case, as after deligation of arterial trunks, it may be some time before an efficient collateral circulation is established, and the functions of the parts are thus but feebly discharged. It is much more probable, however, that changes take place in the clot, which ultimately result in the restoration, partial or complete, of the circulation within the vessel. "The blood," says Murphy, "has the power of separating from itself a fibro-albuminous element without the intervention of any membrane, and independently of any inflamed surface. Through this medium, the coagulum becomes adherent to the sides of the vein (as in the old aneurismal sac); and if it be attached to the whole circumference, the inner portions become softened and broken down. A complete cylinder of fibrin may in this way be formed in the interior of a vein, through which (when the fluid portions of the coagulum are removed) the blood will circulate." We need scarcely wonder, then, that the results of treatment are often unsatisfactory, and convalescence proportionally tardy.

CHAPTER XLI.

PUERPERAL INSANITY.

NOMENCLATURE—NORMAL EFFECT OF PREGNANCY ON THE MIND—INSANITY ASSOCIATED WITH PREGNANCY, LABOR, OR LACTATION—TRUE PUERPERAL INSANITY: PATHOLOGICAL THEORIES: CONNECTION OF PUERPERAL INSANITY WITH ALBUMINURIA—PUERPERAL MANIA: TO BE DISTINGUISHED FROM PHRENITIS: IS ESSENTIALLY A DISEASE OF EXHAUSTION—SYMPTOMS: SIGNIFICANCE OF A RAPID PULSE: VIOLENCE: DELUSIONS—PROGNOSIS—PUERPERAL MELANCHOLIA: DISTINGUISHING CHARACTERISTICS: PROBABLE TERMINATIONS—TREATMENT: PREVENTION: BLOODLETTING TO BE AVOIDED: MANAGEMENT OF THE DIGESTIVE FUNCTIONS: EMETICS: VASCULAR SEDATIVES: NERVOUS SEDATIVES; OPIUM, HYOSCYAMUS, CHLORAL, ETC.: DIET AND REGIMEN: SECLUSION AND RESTRAINT: TREATMENT DURING CONVALESCENCE—TENDENCY TO RECURRENCE AFTER SUBSEQUENT LABORS.

THE term Puerperal Insanity is here chosen in preference to the more familiar designation of Puerperal Mania, for the obvious and, we think, very sufficient reason, that the forms under which mental aberration may occur, in the puerperal state, are various, and the proportion of cases in which the symptoms are of such a nature as to fall under the category of Mania, is by no means so overwhelming as to justify the exclusive use of that name.

It requires no very close observation of pregnancy and the puerperal state, to discover that the mental as well as the bodily functions are, in a very considerable proportion of all cases, disturbed. The psychological phenomena to which we here refer, are far from being symptomatic of mental unsoundness, or what we call insanity, but are indicative merely of the presence and operation of some disturbing influence, dependent, doubtless, upon the condition in which the woman is placed. For example, it is by no means an uncommon thing—as we had occasion to notice in connection with the Signs of Pregnancy—for the temper of the woman to be changed for the worse during the course of a pregnancy. She becomes fretful, capricious, and, in many indescribable ways, different in disposition from what had hitherto been her individual characteristics. Further, the emotional faculties are less under control, when the causeless tears or laughter indicate an hysterical disposition; and, in other cases, the organs of special sense, and especially those of taste and smell, are strangely perverted, in a manner which every practitioner has had opportunities of witnessing. We may, therefore, venture to assume that this psychological sensitiveness can scarcely fail, when it exists, in some degree to predispose to a more serious disturbance of the mental faculties.

Mental alienation, associated with the highest function of the generative organs, occurs under a variety of circumstances. It may thus manifest itself during pregnancy, in the course of labor, during the puerperal state, or while the woman is nursing. The insanity of pregnancy is developed, in the majority of cases, between the third and the seventh month, It is generally characterized by melancholia, or by moral perversion, and the result of treatment is, as compared with the other varieties, very satisfactory. What was described by Montgomery as the mania of labor, is rather a frenzy, or temporary delirium,—the result, probably, of the agony which the woman suffers, or of temporary disturbance of the cerebral circulation. "It is not," he says, "accompanied nor followed by any other unpleasant or suspicious symptom; it occurs, perhaps, after the patient has been talking cheerfully, and, having lasted a few minutes, disappears, leaving her perfectly clear and collected, and returns no more, even though the subsequent part of the labor should be slower and more painful. In every instance which came under my observation, the patients were conscious that they had been wandering, and occasionally apologized for anything wrong they might have said, although they were not aware of what the exact nature of their observations might have been." The insanity of lactation has been observed, in a very large proportion of cases, after the sixth month of nursing,—a fact which, along with the accompanying symptoms, points clearly to the conclusion that the disease is the result of debility, proceeding from an injudicious prolongation of the period of nursing. It is more frequent in women over thirty years of age, and in those who have previously borne children, but especially so in those who have become repeatedly pregnant at short intervals. In this variety also, the insanity more generally assumes the melancholic than the maniacal type.

The subject of true puerperal insanity is, however, that with which we have here more particularly to deal. This distressing affection is by no means of rare occurrence. According to Esquirol, about one-twelfth of the women admitted to the Salpetrière afforded clear examples of this variety, while among the more opulent classes the proportion was even higher,—nearly one-seventh. But even this, we may be sure, gives us no idea of the much greater frequency of the disease, which we may well assume when we reflect that these are merely hospital statistics, and cannot, therefore, embrace the large number of cases which occur in private practice, and which are, from first to last, treated at home, or under private supervision. The statistics of the subject further teach us, that primiparæ are more liable than pluriparæ, and that the class of cases in which susceptibility to puerperal insanity is most marked, are those in which women between the ages of thirty and forty are confined for the first time. In a considerable number,—it is said, indeed, in about half of all cases encountered in practice,—hereditary predisposition has been noted; and it would further appear, that complicated and exhausting labors are much more frequently followed by insanity than those in which the course of labor has been normal. It was first pointed out by Esquirol, and the observation has been confirmed by others, that unmarried women, who feel deeply the degradation of their position, are much more susceptible than others. These then, in addition to the functional susceptibility which is so characteristic of the puerperal state, may be confidently admitted as predisposing causes. But, as regards exciting causes, and the pathology of the disease, there is little upon which we can rely. Cold, imprudence in diet, sudden mental shock, disordered bowels, and a number of other similar conditions, have been generally assumed as causes of puerperal insanity; but most of them, as it appears to us, on insufficient evidence.

From a pathological point of view, the etiology of the subject is even more obscure. We may readily obtain, by observation, abundant evidence of the sympathy which subsists between the uterus and the cerebrum, and we need, therefore, scarcely wonder that attempts have occasionally been made to connect the mental disturbance with uterine lesion. But although we may admit that a certain number of authentic cases have been advanced on undoubted authority, and were we even to concede that metritis may apparently be the proximate cause of insanity in some instances, it is abundantly evident that, in the great majority of cases, no such cause exists. Other instances—to which the same observation may apply—have been recorded, in which there was an apparent connection between the mental disorders to which we refer, and ovarian or peritoneal inflammation. Some writers—among whom we may mention Burns and Davis—were of opinion that the disease was of inflammatory origin, and described it as a modification of phrenitis; but modern experience thoroughly corroborates the view which was taken by Gooch, "that the disease is not one of congestion or inflammation, but one of excitement without power"—an opinion which derives most ample confirmation from the narrative which he gives, in his admirable thesis on this subject, of eleven cases in which there could at no time have been any inflammation of the structures within the cranium. Dr. Ferriar supposed that the loss of reason, in most cases, was mainly due to some interference with the establishment of the function of lactation. On this subject he remarks: "I am inclined to consider puerperal mania as a kind of conversion. During gestation, and after delivery, when the milk begins to flow, the balance of the circulation is so greatly disturbed as to be liable to much disorder from the application of an exciting cause. If, therefore, cold affecting the head, violent noises, want of sleep, or uneasy thoughts, distress a puerperal patient before the determination of blood to the breasts is regularly made, the impetus may be converted to the head, and produce either hysteria or insanity, according to its force, or the exciting cause." Such a theory seems, however, in the present state of our knowledge, to have little to recommend it.

One of the most interesting of modern speculations, with regard to the pathology of puerperal insanity, had its origin in a suggestion which was made by Simpson, that there might be an essential connection between that disorder and disease of the kidney, or at least the presence of albumen in the urine. That the disease may thus or in some other way have a toxæmic origin is, of course, perfectly possible; and the theory has further a peculiar interest in connection with puerperal eclampsia, in which albuminuria is a phenomenon familiar to modern pathologists. Simpson's original suggestions on this subject, which were published in 1857, depended upon the observation of four consecutive cases, in all of which he found albumen present in the urine. His subsequent experience, with ample corroborative evidence from other sources, can leave little doubt in the mind that his first idea was correct, and that between the two conditions there probably exists an essential though inexplicable bond of association. It would appear that the presence of albumen is only indicated by the usual tests for a short time after the attack commences, and is, therefore, less persistent than in the case of convulsions. "The fire of disease goes on burning," says Simpson, "in these cases of insanity, after the lighted match is merely applied, and the strange, morbid clockwork runs on, as it were, after the key that wound it up is withdrawn. I have seen all traces of albuminuria in puerperal insanity disappear from the urine within fifty hours from the access of the malady. The general rapidity of its disappearance is, perhaps, the principal, or, indeed, the only reason why this complication has escaped the notice of those physicians among us who devote themselves with such ardor and zeal to the treatment of insanity in our public asylums."

Dr. Simpson, while making no pretence of solving what all admit to be a pathological riddle, seems to think that the cause of this disease may hereafter be discovered by the pathological chemist to consist in certain changes in the renal secretion, involving, secondarily, chemical changes in the blood itself. One well-known effect which is apt to follow the appearance of albumen in the urine, is a diminution in the quantity of urea excreted. But, as Frerichs has shown, the mere presence of an excess of urea in the blood does not necessarily involve a septic action on the nervous system; and the same able observer holds that the decomposition of urea, resulting in the formation of carbonate of ammonia, affords a satisfactory explanation of the intoxicating or poisonous effect which is produced through the blood upon the nervous centres in the case of puerperal eclampsia. And it is, perhaps, not too much to assume that this theory, if correct in the case of convulsions, may equally apply to the phenomena of puerperal insanity. Dr. Simpson suggests further, in support of this theory, that the state of the blood is favorable to the occurrence of such decomposition as may be necessary to the formation either of the carbonate of ammonia, or of some other organic toxicological agent, possibly of an *alkaloidal* character. "In the blood of the puerperal female," he writes,—"greatly modified as it is in the normal states of pregnancy and delivery, and containing as it does after parturition the effete elements of the involving or disintegrating uterus, and the materials for the new lacteal secretion—ferments and agents may possibly exist which are more apt to develop special morbid poisons out of the retained renal excretions, than happens in other states of the system. But, I repeat, the whole subject is yet quite dark and conjectural, and will remain so till pathological chemistry is able to cast some light upon it."

Dr. Donkin, of Newcastle, contributed a very excellent paper on this subject.[1] Recognizing the fact that puerperal insanity may present itself under a variety of forms, he deduces from the history of recorded cases, facts which appear to him to warrant the conclusion "that the acute dangerous class of cases are examples of uræmic blood-poisoning, of which the mania, rapid pulse, and other constitutional symptoms are merely the phenomena; and that the affection, therefore, ought to be termed uræmic or renal puerperal mania, in contradistinction to the other form of the disease." Although most persons, familiar with the subject, will probably consider that Dr. Donkin goes too far in thus treating the matter as a fact conclusively demonstrated, his paper is replete with interest, and will well repay the trouble of perusing it.

The form of puerperal insanity which is of most frequent occurrence is that in which the symptoms are commonly manifested within a fortnight after delivery, and present with greater or less distinctness the characteristic features of acute mania. It is to this alone—the *paraphrosyne puerperarum* of Sauvages—that the designation "Puerperal Mania" can with perfect propriety be attached. Of fifty-seven cases noticed by Burrows, thirty-five were maniacal, sixteen melancholic, and eight alternating; and, although the relative proportion of cases has varied according to the experience of various writers, all agree that the maniacal cases are greatly in excess of the others. This is, no doubt, the class of cases, the observation of which by the earlier writers on the subject gave rise to the idea that the violence of the symptoms was due to inflammation. It were absurd to deny that phrenitis is possible in lying-in women as in others; but no one now questions the accuracy of the statement made by Gooch, "that furious delirium from inflammation of the brain is a rare disease in childbed." What seems to have given, for a time, apparent confirmation to the inflammatory theory was the fact that in fatal cases of puerperal mania, the brain was found congested. The experiments of Dr. Kelly, upon the lower animals, and a host of pathological facts which have been put on record since his day, have conclusively proved to demonstration, what is familiar to every modern pathologist—that death from hemorrhage and other exhausting causes, produces in the brain that very appearance of increased vascularity which, as we assume, was accepted by Burns, Davis, and others, as evidence of inflammatory action.

Although, therefore, we admit phrenitis to be classed as a *possible* complication of the puerperal state, there is little likelihood of our diagnosis being obscured by such an occurrence. The very early period of its accession after delivery, and the manifestation of headache, suffusion of the eyes, and other local symptoms referable to the head, would doubtless indicate the nature of the disease to the judicious practitioner. But not only do we discard the idea of inflammation as pathognomonic of puerperal mania, but we embrace without hesitation a directly opposite view, that it is essentially a disease of exhaustion. This is so far indicated by the fact already mentioned, that puerperal insanity in both its forms is more common after exhausting and operative cases, than when the progress of labor has been normal. It is further strongly corroborated by the details of treatment,—in which we are not astonished to find that patients fainted after the abstraction of a few ounces of blood; and by the experience of the most reliable modern authorities.

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[1] Edinburgh Medical Journal, May, 1863.

The symptoms of puerperal mania do not differ in any very essential particular from those which are exhibited by patients who are the subjects of the same disease unconnected with the puerperal state. Still, there are peculiarities which are of sufficient importance to warrant a special description of the features of what we may call a typical case. The observer of psychological phenomena does not require to be told that there are great, and even perplexing, differences in individual instances. In cases in which an attack on former occasions, hereditary tendency, or any other cause, may particularly direct our attention to the patient, or when the observer has had much special experience in the treatment of insanity, a certain restless, anxious manner, with more or less of irritability, will some time presage the coming storm, and certainly one of the worst possible of premonitory symptoms is obstinate insomnia, or unrefreshing rest broken by frightful dreams. We borrow from Dr. Ramsbotham the following graphic description of this, and the subsequent stages of the disease:

"In mania there is almost always, at the very commencement, a troubled, agitated, and hurried manner, a restless eye, an unnaturally anxious, suspicious, and unpleasing expression of face;—sometimes it is pallid, at others more flushed than usual;—an unaccustomed irritability of temper, and impatience of control or contradiction; a vacillation of purpose, or loss of memory; sometimes a rapid succession of contradictory orders are issued, or a paroxysm of excessive anger is excited about the merest trifle. Occasionally, one of the first indications will be a sullen obstinacy, or listlessness and stubborn silence. The patient lies on her back, and can by no means be persuaded to reply to the questions of her attendants, or she will repeat them, as an echo, until, all at once, without any apparent cause, she will break out into a torrent of language more or less incoherent, and her words will follow each other with surprising rapidity. These symptoms will sometimes show themselves rather suddenly, on the patient's awakening from a disturbed and unrefreshing sleep, or they may supervene more slowly when she has been harassed with watchfulness for three or four previous nights in succession, or perhaps ever since her delivery. She will very likely then become impressed with the idea that some evil has befallen her husband, or, what is still more usual, her child; that it is dead or stolen; and if it be brought to her, nothing can persuade her it is her own; she supposes it to belong to somebody else; or she will fancy that her husband is unfaithful to her bed, or that he and those about her have conspired to poison her. Those persons who are naturally the objects of her deepest and most devout affection, are regarded by her with jealousy, suspicion, and hatred. This is particularly remarkable with regard to her newly born infant; and I have known many instances where attempts have been made to destroy it, when it has been incautiously left within her power. Sometimes, though rarely, may be observed a great anxiety regarding the termination of her own case, or a firm conviction that she is speedily about to die. I have observed upon occasions a constant movement of the lips, while the mouth was shut; or the patient is incessantly rubbing the inside of her lips with her fingers, or thrusting them far back into her mouth; and if questions are asked, particularly if she be desired to put out her tongue, she will often compress the lips forcibly together, as if with an obstinate determination of resistance. One peculiarity attending some cases of puerperal mania is the immorality and obscenity of the expressions uttered; they are often such, indeed, as to excite our astonishment, that women in a respectable station of society could ever have become acquainted with such language."

We have no reliable information as to the number of cases which prove fatal, but there is no doubt that one of the most important symptoms as indicating the probability of a fatal result is extreme rapidity of the pulse. "Mania," said William Hunter, "is not an uncommon appearance in the course of the month, but of that species from which they generally recover; when out of their senses, attended with fever like paraphrenitis, they will in all probability die." Gooch corroborates generally this assertion, and narrates in illustration a very interesting case: "One evening, several years ago, a surgeon called upon me, wishing me to return with him many miles into the country, to see his wife, who had become maniacal a few days after her delivery. I was at that time attending a lady in her first labor whom I could not leave, but I offered to go with him if he would wait till the labor was over. It was going on wearily, there was no prospect of its being over before the morning, and as he was anxious to return home, he took another physician whom I recommended. Before leaving me, however, he said he should like to talk with me about the case. I took down a volume of Dr. William Hunter's manuscript lectures and showed him this passage (quoted above). He said he was sorry to read it, for that his wife's pulse was very rapid. About a week afterwards, I heard that she was dead." It would appear, however, as if the views of Hunter and Gooch had found too literal an interpretation in many modern treatises, for it would almost seem to be the deliberate opinion of some, that a rapid pulse meant death and a slow one recovery. The pulse is probably the most certain indication which we have, but it is not to be relied upon solely, to the exclusion of others. Extreme rapidity in the beats is in this, as in all the other more serious disorders of the puerperal state, a symptom of grave import; but too much has been made of it;

and, for our part, we are quite convinced that there are many cases in which the pulse rises above 120, and remains at that rate for days in succession, and yet convalescence is ultimately quite satisfactory. When the pulse suddenly rises at the commencement of the attack, the symptom is undoubtedly more alarming.

In the worst cases, the milk and lochia are entirely suppressed; but this is not usually the case, although both functions are more or less interfered with, the nutritive value of the milk, at least, being generally deteriorated. There is obstinate insomnia, which often defies the calming influence of the strongest drugs. The digestive functions become impaired in a marked degree, the tongue being furred, and the odor of the breath not unfrequently offensive. The urine is scanty and high-colored; and the alvine evacuations are offensive—there being sometimes diarrhœa, but more frequently constipation. The cases in which the patient is extremly violent are exceptional; but it is often impossible, or at least a matter of great difficulty, to induce her to remain silent or at rest. She insists on rising to discharge some imaginary neglected household duty, and her delusions may turn into all kinds of odd channels. She in many instances refuses food, and it may, on this account, even be necessary to use force in order that such nutriment as is essential to maintain life may be introduced into the stomach. The delusion, in one very obstinate case of this nature which came under our observation, was, that putrefaction was going on internally, and that food only tended to supply material for the morbific process; and in other cases it has been noticed, that, although the patient obstinately refused food when urged to take it, she would, if she could obtain it furtively, take it greedily and voraciously. Again, a prominent characteristic of these cases, which adds greatly to the responsibility of their management, is the undoubted tendency to suicide, which may show itself in many ways, although hidden with all the craft and cunning of insanity.

It has been remarked as a feature characteristic of puerperal mania, that, occasionally, the woman, although her mind is pervaded by delusions, has a strange underlying consciousness that her thoughts and actions are under the influence of some mysterious power. It has been stated, that seldom or never is this *consciousness of a delusion* manifested in other forms of insanity. Gooch states that the symptoms, in some cases observed by him, closely resembled those of delirium tremens, and he has also seen symptoms, of the nature of catalepsy, which were associated with distinct puerperal mania. If we may accept as probable the theory to which allusion has already been made,—that albuminuria, in mania as well as in eclampsia, points to the proximate cause,—we cannot be astonished to find that clinical experience in some measure seems to indicate a connection between them. We even find, that by some the expression "epileptic puerperal mania" has been employed as indicating the occasional coincidence of the phenomena of eclampsia with those of mental aberration. In some instances, the mania has been preceded by convulsions, while in others the mental phenomena have been the first to develop themselves.

The Prognosis of these cases involves, as will readily be understood, questions of deep interest in individual instances. As regards the risk to life, it is, as we have attempted to show, an error to suppose that a rapid pulse is necessarily the forerunner of death. But there is another error, which at one time led to a contrary belief. This finds expression in a remark which Dr. Gooch attributes to Dr. Baillie, who, when consulted about a case, remarked "that the question was not whether she was to get well, but when she was to get well." To this Gooch adds dryly, "the patient died a week after this prognosis." The fact is, that death from puerperal insanity does now and again occur, and more frequently from the maniacal than from the melancholic form. Dr. Churchill says that he should himself lay great stress, in forming a prognosis, upon the presence or absence of uterine complications, and the observation, coming from such a source, merits careful attention.

The question of prognosis involves not only the danger to life, but the prospect of speedy restoration to reason. In this respect, in so far as mania is concerned, we may look forward with considerable confidence, especially in the absence of hereditary predisposition, to an early recovery. "Within three weeks," says Dr. J. B. Tuke,[1] "or more frequently earlier, the mania gradually subsides, and is replaced by a state of dementia, generally accompanied by delusions, which almost invariably assume the form of mistaken identity. These gradually disappear, leaving a haziness of apprehension, and a state suggesting the idea of waking from a dream. The patient can now, generally, be induced to work, and otherwise employ herself. From that moment you may look with almost certainty to ultimate recovery." There are cases, however—chiefly those of hereditary taint—in which the delusions become confirmed, and in which, although the general health may have been quite restored, the mental aberration is persistent. Dementia, of a more serious nature than that mentioned by Tuke, gradually takes the place of mania, and hopeless chronic insanity is the result.

Although in the insanity of pregnancy the majority of cases are of the melancholy type, it is otherwise with true puerperal insanity; where melancholia, although by no means rare, is, as compared with mania, comparatively unfrequent. Few cases which, from the first, come under this category, present characteristic symptoms earlier than the sixteenth day, and a large proportion of cases come on considerably later than this. All at first may go on to our perfect satisfaction; the patient has been able to leave her bed at the usual time; her appetite is good; she sleeps well, and is able to nurse her child; it is assumed on all hands that convalescence has been satisfactorily established. Perhaps a month after the birth of the child, a change comes over the mother, which, to her attendants, is quite inexplicable. The pride and interest in a first-born child gradually fade away, and a cloud of sadness, utterly without cause, slowly spreads itself over the aspect and demeanor of the mother. Causes, which are either imaginary, or, if real, are of the most trivial character, give rise to fits of silent weeping, during which the patient is not demonstrative, and rather avoids than seeks sympathy. The gloom deepens as the curtain falls. No longer does the cry of the infant awaken a tender sympathy in her heart; on the contrary she maintains a moody silence, and not only never inquires for her infant, but seems to look upon it with actual aversion. Delusions—all of the melancholic type—if they have not already manifested themselves, now become apparent. She believes that in marrying she has violated some important moral obligation. While she heaps all sorts of accusations on her own head, she comparatively rarely complains of others. Too frequently the religious element enters into her morbid ponderings, and she fancies herself lost, and her soul beyond all hope of salvation.

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[1] Edinburgh Medical Journal, May, 1865.

And not by day only, but by night, do these gloomy impressions weigh upon her mind, so that sleeplessness is an early and most troublesome symptom, resisting often all the ordinary methods of alleviation. The appetite fails, or becomes capricious; or she may absolutely refuse to take any nourishment, except upon earnest solicitation, or even the employment of force. As the lochial discharge has most likely ceased before the symptoms of insanity make their appearance, no reference need be made to that; but, as regards the lacteal secretion, it will generally be observed that, even in robust women, who previously had an abundance of milk, it is rapidly arrested, and the breasts become flaccid. The bowels are sometimes tolerably regular, but, as a rule, are constipated, and the dejections fetid. The urine is high in color and scanty, unless there is an hysterical element in the case, when there may be a great flow of a low specific gravity. The pulse may be accelerated, but is seldom so continuously. In some instances, symptoms of moral insanity are prominent. In cases in which there has been—even long previously—a tendency to intemperate habits, these may reappear, in the earlier stage, in the form of aggravated dipsomania, in which the morbid craving for stimulants may assert itself in the most intense form; and the patient will, if unable to procure ordinary stimulants, greedily consume eau de Cologne, spirits of sal volatile, valerian, or spirits of lavender, should such be left within her reach. And, in like manner, the pica of pregnancy may appear in an exaggerated form, when she will eat soap, or even more disgusting substances which may be at her command.

The progress and ultimate issue of such a case are matters which give cause for deep apprehension. It is not a fatal result that we dread so much as permanent insanity. The observation of Gooch on this point merits the dignity of an aphorism, when he says that "mania is more dangerous to life, melancholia to reason." When the two varieties—mania and melancholia—are considered together, it has been said that the period of convalescence ranges from a few days to two years; but, if we take the trouble to analyze the cases, and separate the one class from the other, it will become quite obvious that the examples of protracted convalescence are, almost invariably, those in which melancholy has been the prevailing type. And, in like manner, if we avail ourselves of such statistical observations as may seem most reliable, it is equally clear that the melancholic cases afford by far the greater number of those instances in which reason has permanently succumbed. In so far as we can gather from the observations of those who have given most attention to the subject, it would seem that the existence of albumen in the urine has no such marked association with puerperal melancholia as it has with mania of the same class; but this is a point in regard to which more extended clinical study is still required.

Treatment.—From every aspect of the case, the treatment of puerperal insanity is a subject of surpassing clinical interest, and one which deserves, we venture to assume, more attention than has, in some systematic works, been accorded to it. This is particularly the case as regards prevention; for we can scarcely doubt that, when the symptoms are such as to indicate disturbance of the cerebral functions, much may be done, in the way of warding off an attack, by a judicious employment of the remedies to be hereafter mentioned. This remark applies chiefly to cases where there is a marked hereditary taint, or where the patient has been insane at previous confinements. An illustration of the latter came recently under the notice of the writer.

A delicate lady, who had married very young, became insane (maniacal) about ten days after her first, and nine days after her second confinement, and on the latter occasion the convalescence had been extremely protracted, and the danger to life at one time great. Much anxiety was naturally felt by herself and her friends on the approach of a third confinement, particularly as, towards the end of the ninth month, she became hysterical, sleepless, and melancholy, as on the former occasions. A very remarkable feature in the case was the tendency to dreams of a disturbing kind, which not only rendered such sleep as she obtained unrefreshing, but made her actually dread falling asleep. The state of the tongue and dejections indicated considerable derangement of the digestive functions. As the period of expected delivery approached, the symptoms became still more marked; but they seemed to be, in some degree, under the control of the remedies which were adopted, the most effectual being hydrate of chloral for the nervous symptoms, and colocynth, with hyoscyamus, for the bowels. Labor passed over quite favorably, and in every respect satisfactorily, the patient being, however, as might have been anticipated, very feeble and exhausted after its completion. After delivery, very strict precautions were observed to maintain perfect quietness, and freedom from any possible worry or annoyance. A certain amount of sleep was obtained by chloral; opium made matters worse. The child was not put to the breast, and the lacteal secretion was easily kept under. It was, in this case, a matter of intense interest to watch the struggle for reason; for, although at no time did she exhibit symptoms of insanity, there was not the slightest doubt that she was on the verge of it; but happily, after a fortnight had elapsed, she rapidly improved, her appetite increased, and she enjoyed natural and refreshing sleep; until, ere many more days had passed, she was pronounced convalescent. It is too much to expect that this narrative proves that an impending attack of mania was warded off; but the impression is, nevertheless, fixed on the minds of those who watched the case, that constant and anxious supervision, and, above all, skilful and judicious nursing, saved the patient from a recurrence of her former malady.

The cases, however, in which preventive treatment can be expected to be of much avail are probably of very rare occurrence; and there, no doubt, is a danger—against which we would caution the inexperienced—of looking with apprehension upon what our fears may magnify into premonitory symptoms, and thus adopting, on insufficient grounds, methods of treatment, upon the successful results of which we complacently congratulate ourselves.

The symptoms which accompany a violent attack of puerperal mania—when there is rapid pulse, heat of head, and great cerebral disturbance—are such as very readily to explain how, for so long a period, the lancet was employed as a measure of the veriest routine. Apart from the theory of phrenitis, the very violence of the symptoms seemed to demand prompt and free bloodletting. The change which public and professional opinion has undergone during the last forty years is, however, such that we scarcely think it necessary to recommend caution in regard to this once familiar remedial measure. Were it otherwise, we might point to many facts which conclusively prove that puerperal mania is essentially a disease of debility; and that, if the heat of head, and other local symptoms, should seem to suggest the application of leeches to the temples, even this practice must be adopted with the greatest possible caution; for cases have undoubtedly occurred in which a very moderate loss of blood has precipitated a fatal result. In cases of actual phrenitis, bloodletting is, of course, in some form or other, urgently demanded; but no real difficulty should prevent the discrimination of these very rare cases from the ordinary varieties of puerperal mania.

The gastro-intestinal disturbance, which is so invariable an accompaniment of the case, requires, from the first, careful attention and generally prompt treatment. If the bowels, therefore, are overloaded, a purgative should at once be administered; and, although we must not expect an immediate cure, as in one of Gooch's cases, we may look for some relief in the symptoms, and especially of the irritability and restlessness so characteristic of the disease. But it will not suffice simply to see that the bowels are thoroughly cleared of their contents, which are often highly offensive; for, be the case long or short in its duration, the judicious regulation of the bowels is one of the most important indications of treatment. For this purpose aloetic purgatives are appropriate from their derivative action. It would appear that, in some cases, signal benefit has been derived from the administration of emetics. "If the powers of the constitution are not low, and the gastric symptoms are very marked—namely, a foul tongue, an offensive breath, and a yellow eye—an emetic, not of antimony, but ipecacuanha, may be given." So wrote Gooch, and most modern writers have repeated his recommendation of emetics, at least as an exceptional method of treatment. Care must be taken, of course, not to administer those depressing agents when the face is pale, the skin cold, and the pulse quick and weak; and indeed, the more prominently we keep before us the leading fact that puerperal insanity is a disease of debility, the less likely will we be to have recourse to antiphlogistic remedies.

Although bloodletting is, for reasons already fully explained, contraindicated, there is often observable such a degree of vascular excitement, that we may naturally inquire whether this cannot be allayed by some safer measures. The application of cold to the head, or, what is even better, laving the forehead and temples with warm water—after which there is a refreshing feeling of coolness—may produce the desired effect. In other cases, we may administer any of the vascular sedatives, of which none, probably, will be more likely to effect the purpose we require than tartar emetic, in such doses as may be necessary to produce a depressing effect—taking great care, for obvious reasons, not to push it too far. One or two drops of the tincture of aconite, or of the tincture of veratrum viride, have been recommended by Simpson for the same purpose.

Undoubtedly, the most important remedies to which we have to refer are the class of nervous sedatives. At the head of the list stands opium—the sheet-anchor, as it has been called, of the alienist physician. It is to be observed, however, that there exists a considerable diversity of opinion as to the propriety of administering opium in the puerperal varieties of insanity. It is quite certain that in some cases it proves of no avail, while in others the result is the reverse of beneficial. Simpson, who admits this, says, "Whatever may be the way in which you give the drug, remember always, as the general rule to guide you in its administration to such patients, that it must be given in very large doses. If you expect to have any good effect from it, you must give, in general, not less than two or three grains of solid opium, or an equivalent dose of some of the cognate preparations." If unusual difficulty is encountered in the administration of the drug in the ordinary way by the mouth, the same authority recommends the introduction into the rectum of a suppository containing one or two grains of morphia; and he mentions an interesting case in which that was followed by a sleep of sixteen hours, from which the patient awakened quite free of maniacal symptoms. Dr. Tuke observes that the exhibition of opium, as well as of the other narcotics, is not beneficial when the leading symptom is acute mania; and it is well that we should bear this observation in mind as coming from one of much experience in the treatment of all forms of insanity. In some instances chloroform has been employed with much benefit, the patient being brought fully under the effect of the anæsthetic, a little more being given from time to time as she seems about to awake. Hyoscyamus, in combination with ether or ammonia, and Indian hemp, have also been employed with the same object. Camphor was Gooch's favorite remedy, but it is not now so frequently employed as at one time it was. The hydrate of chloral is another remedy which has of late, to some extent, superseded opium in the treatment of insanity, as in many other disorders; and experience seems to show, that in this drug we have a most important addition to the materia medica of the class of diseases in question. The use of the warm bath should not be forgotten in an enumeration of sedative agents, and there can be no doubt, that by it a beneficial effect is produced even when drugs have failed. Let us always remember that the primary object which we have in view, in the exhibition of this class of remedies, is to procure sleep. If we succeed in our object, the patient may at once recover;

but, unfortunately, as a rule, she relapses, on awaking, into the violence and delusions of her unhappy state.

As regards diet, the cases are probably very rare in which we would venture to give what is commonly called low diet. But the condition of the stomach and bowels must, of necessity, prevent us from being too liberal in this respect just at first. Still, the condition of the patient is such, that we should at once permit the use of soups in moderation, along with other substances of easy digestion which may suggest themselves. In many cases, a small quantity of wine may be added, about two ounces, perhaps, in the first instance, to be increased as the necessities of the case may seem to require. As the case goes on, it will generally be proper to give more generous diet, and to be more liberal, it may be, in the use of stimulants; for we may be perfectly sure, that, as this was a disease of debility from the first, an improved physical condition is an essential concomitant of recovery.

The general management and control of the patient involves the important points of seclusion and restraint. Our aim, in this respect, is, above all, to guard the woman from whatever may prove a source of excitement. The experience of every one clearly proves, that to permit of free association with relatives and friends is, in the highest degree, injudicious. Such interviews give rise to excited appeals as to being relieved from the irksomeness of restraint, and generally awakens in the mind painful impressions, which leave the patient for a time in a worse mental condition than before. In most cases, therefore, in which the symptoms show any obstinacy, it is well to separate the patient from her friends, and to leave her entirely to the management of those who have special experience in the treatment of the insane. This should, if possible, be done in her own house, for we confess to a great reluctance to send persons suffering under this comparatively curable variety of insanity to be immured in a lunatic asylum, to associate, probably, with persons whose minds are also deranged. We do not deny the advantage of a system of constant and intelligent supervision, but if this can be equally well secured at home, it is always well to avoid the stigma which attaches to confinement in an asylum, and which many women, after their recovery, will feel most acutely. As reason is gradually being restored, too great caution can scarcely be exercised in permitting her to renew her intercourse with her friends; and, if it should seem that interviews with them still excite her, the period of seclusion must be extended. There are cases, however, in which the visit of a relative or friend has the best possible effect, in diverting the mind from its morbid condition into channels which are more healthy, by reason of the association of ideas which recall the past. It is at this stage that change of air and scene is more particularly beneficial. During the whole course of treatment, the patient should not be left for a moment alone, and, as a prominent characteristic in such cases is suicidal impulse, it is always proper to see that nothing be left within her reach which might render self-injury possible.

The treatment of melancholia differs in no essential respect from what has been prescribed as proper to the maniacal cases. There will, of course, in cases which manifest this type of insanity, be no necessity for the use of any of the vascular sedatives, as the circulation is little, if at all, disturbed. From the first, therefore, we should adopt a more nutritious regimen than in the other and more frequent cases; but, unfortunately, we must look forward to a long illness and lingering convalescence, and, in some unhappy instances, to the symptoms gradually being merged in those of hopeless dementia. It will more frequently be found necessary, in the melancholic cases, to remove the patient from home, and even to place her in strict confinement.

The question of the recurrent nature of the disease is the only other point upon which we need touch; and it is one in regard to which authors do not seem to be agreed. Gooch thinks that it is unusual; but a careful observation of such meagre statistical facts as are at our command seems to point strongly to the conclusion, that there is a decided tendency to the recurrence of the disease in the subsequent pregnancies of women who have previously been the subjects of puerperal insanity. It is in cases in which there is an hereditary taint that this is most distinct, but the tendency in all cases is sufficiently marked to warrant us in taking every precaution to avoid the other exciting or predisposing causes of the disease. Tuke's cases were recurrent in the proportion of fifteen cases out of seventy-five.

CHAPTER XLII.

PUERPERAL ECLAMPSIA.

DEFINITION—CONNECTION BETWEEN ECLAMPSIA AND ACUTE BRIGHT'S DISEASE—ECLAMPSIA FROM OTHER MORBID CONDITIONS—EFFECTS OF PREGNANCY ON THE SYSTEM—PERIOD OF EXPLOSION—SYMPTOMS: PREMONITORY SIGNS; ŒDEMA, ALBUMINURIA, CEPHALALGIA, ETC.—PHENOMENA OF THE FIT: PERIOD OF TONIC AND CLONIC CONVULSIONS, AND OF COMA—PATHOLOGY: ALBUMINURIA: DECOMPOSITION OF UREA, AND FORMATION IN THE BLOOD OF CARBONATE OF AMMONIA: EFFECTS OF PRESSURE ON THE RENAL VEINS: DETECTION OF ALBUMEN IN THE URINE—MORBID ANATOMY—EFFECT OF LABOR-PAINS—MATERNAL AND FŒTAL MORTALITY—PROGNOSIS: IN ECLAMPSIA GRAVIDARUM, PARTURENTIUM, ET PUERPERARUM—TREATMENT: PROPHYLAXIS: USE OF ACIDS: PURGATIVES AND DIURETICS: INDUCTION OF PREMATURE LABOR: TREATMENT DURING THE FIT: BLOODLETTING; CHLOROFORM; CHLORAL: OBSTETRICAL TREATMENT AT VARIOUS STAGES OF LABOR; ACCELERATION; RUPTURE OF THE MEMBRANES; USE OF THE FORCEPS.

UNDER the designation of Puerperal Eclampsia are included, not only such instances of the malady in question as are manifested during the puerperal period, but all cases, without exception, which are observed in the course of pregnancy, during labor, or after delivery. It was for this reason that we deferred any notice of Eclampsia as a complication of gestation or delivery, until, having the whole subject before us in its broadest aspect, we should be in a position to review the highly interesting speculations to which modern pathology has of late so largely contributed.

It is scarcely necessary to remark that the affection which we are now about to consider does not include all cases, without exception, in which symptoms of the convulsive or epileptiform type manifest themselves during pregnancy or childbed. It is, for example, a disorder distinct from, although, in its more conspicuous phenomena, closely analogous to, epilepsy. But, so great is the preponderance of cases in which the symptoms of true puerperal eclampsia exist, that we think we are perfectly justified in agreeing with those who look upon a certain train of symptoms and pathological facts as essential, or nearly so, to the disease in question. "Eclampsia puerperalis," says Braun, "is an acute affection of the motor function of the nervous system, characterized by loss of consciousness and of sensibility, by tonic and clonic spasms, and occurs only as an accessory phenomenon of another disease, generally of Bright's disease in an acute form, which, under certain circumstances, spreading its toxæmic effects on the nutrition of the brain and the whole nervous system, produces those fearful accidents. The toxæmia (or blood-poisoning) in eclampsia gravidarum, parturentium et puerperarum, is commonly produced by uræmia; *i. e.*, by a change of urea which is retained in the blood, or by retention of the excrementitious constituents of the urine. . . . Under the common appellation of "Eclampsia" several pathological processes have hitherto been comprehended, which do not even present an identical series of symptoms, and which have only this in common, that there exist tonic, and specially clonic spasms, along with loss of sensibility."

The exceptional varieties of eclampsia, to which the author here refers, are cases in which the origin is to be discovered in defective purification of the blood, arising from quite different causes,—such as imperfect elimination of carbonic acid through the lungs, the retention of bile in the blood (*cholæmia*), or the operation within that fluid of certain other septic agents,—the nature of which is little understood,—such as are developed occasionally in the course of typhus, or some other continued fever. Epilepsy, when it occurs, is to be distinguished partly by the symptoms of the attack, but more particularly and conclusively by the absence of albumen in the urine. Cases have been met with, in which the cause was presumed to reside in an altered condition of the blood, as regards the proportion of its various normal ingredients,—such as hyperinosis, leukæmia, or hydræmia. One of the symptoms which immediately precede dissolution, in cases of hemorrhage, is a convulsive seizure, presenting most of the features of eclampsia, and supposed by most authorities to be due to anæmia. Finally, and putting aside the cases in which convulsions are due to some diseased condition or functional disturbance of the nervous centres, there are other instances, in which an irritation of the peripheral nerves gives rise, by a reflex action, to similar symptoms, which are often associated with other hysterical manifestations, and are therefore called, with some propriety, hysterical convulsions. With rare exceptions, then, arising from these or similar causes, puerperal eclampsia may be looked upon as essentially connected with uræmic poisoning, which, again, is associated with, or dependent upon, an albuminous condition of the urine.

Before entering upon the consideration of the symptoms and pathology of this alarming disorder, it may be well to look closely, were it but for a moment, upon some of the conditions essential to the pregnant state. The constitutional sensitiveness, to which we have already more than once referred as eminently characteristic of pregnancy, can scarcely fail to display itself in its relation to the nervous system and its all-pervading influence. Dr. Barnes has quite recently[1] argued, with much force and great ingenuity, in favor of a theory which he advances, that nature provides, against the period of parturition, a special supply of nerve-force; that this is associated with an increased irritability of the nervous centres; and that it implies a corresponding organic development of the spinal cord. This involves, we apprehend, pretty much the same idea as that which we have expressed, although it is couched in more precise and more philosophic terms. What more likely, may we not infer, than that the force of a nervous system thus surcharged may, by a derangement of excited signals, be reflected upon the wrong track, and thus excite convulsive action in unlooked-for quarters, and frequently disaster as the result? This, indeed, affords a striking illustration of what has often been remarked by the most acute observers, that the more closely we study the state of the functions during pregnancy, the more are we inclined to wonder, not that functional disturbances arise, but that, in so large a preponderance of cases, there is so little apparent deviation from the normal standard. But, besides this, we cannot but regard the altered condition of the blood in pregnant women, as, in some degree, predisposing to a morbid condition, one of the essential factors of which is an abnormal state of the blood itself. These changes, as formerly mentioned, consist in an increase of water and of fibrin, a diminution in the quantity of albumen, and a reduction in the proportion of the red, with a relative increase in the white corpuscles.

There is another point of great interest, to which Barnes directs attention in his lectures above alluded to,—that all generative acts manifest an emotional and a convulsive element. "It further deserves to be noted here, that emotion takes a large part in every act or process of the generative function. In short, emotional affectability is the measure of convulsive liability. Another proposition I would state is the correlative of the preceding one. It may not be quite so obvious in its truth, but I think I shall be able to show that it is equally constant. It is this: An energy which may be compared with, if not identical in nature with, convulsion, is an essential element in the leading acts of the generative function. I have known instances of an epileptic fit being repeatedly induced by the sexual act. I have heard of several other like cases. Voisin mentions one. La Motte knew a woman who, not pregnant, always vomited *solâ actione coitûs.*"

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[1] See his Lumleian Lectures on the Convulsive Diseases of Women. Lancet, April, 1873.

The period at which eclampsia most frequently develops itself, is generally stated to be during the course of labor. As, however, it is also noticed for the first time during the last weeks of pregnancy in a large number of cases, and as labor is often an immediate result of a convulsive seizure, it cannot be an easy matter to determine what is its relative frequency with regard to the three periods of pregnancy, labor, and childbed. According to Braun and Wieger, more than half of all cases occur during labor, but, for the reason above stated, this may well be admitted as doubtful, and, for our part, we are inclined to agree with the conclusions of the writer of the able article on this subject in the "Nouveau Dictionnaire de Médecine et de Chirurgie Pratiques," that the relative frequency of the three epochs is correctly expressed in the following order,—pregnancy, labor, after delivery. Statistics are not much to be relied upon, but it may be noticed that an average of English and Continental practice seems to yield about one case of eclampsia in 350 labors.

Symptoms.—Although the convulsive seizure sometimes comes on quite unexpectedly, there are probably few cases in which premonitory symptoms, of some kind or other, might not have been detected. One of the most important of the premonitory symptoms is œdema, which, indeed, is of common occurrence, especially in the ankles, feet, and labia majora. This œdema is generally developed some weeks before the appearance of the first fit, and it is occasionally, although somewhat rarely, to be observed in the upper part of the body and in the face. Should this symptom be manifest, the suspicion of the attendant will, almost as a matter of course, be excited, with the result of an immediate examination of the urine, which will be found to yield a large quantity of albumen by the ordinary tests of heat and nitric acid. The microscope, in most of these cases, reveals the presence in the fluid of hyaline tube-casts, with or without blood-corpuscles; or it may indicate, by appearances familiar to the pathologist, the presence of more advanced and serious renal disorder.

In a considerable number of instances, no œdematous indication attracts attention, even although undoubted albuminuria exists; but, when this more conspicuous and familiar symptom is absent, there are other premonitory symptoms, which, in some cases, are of high importance, and, in all, demand careful attention. According to Chaussier, there are three symptoms which, as premonitory indications, deserve special attention: these are cephalalgia, derangements of vision, and epigastric pain. The headache—which is the most frequent of all—is extremely acute, and is usually complained of in the frontal region. At first it is intermittent, but subsequently, and especially when the fit is near at hand, the pain often becomes continuous. When the sense of sight is in any way disturbed, this is justly looked upon as an indication of grave import. There is, at first, either cloudiness or dimness of vision, or that peculiar indistinctness which gives one the idea of looking through the highly rarefied atmosphere over a furnace—familiar to those who are the subjects of trifling biliary derangements. In other examples, objects seem to exhibit peculiar colors, and the vision becomes gradually more impaired, although in some instances the affection is intermittent. Very often the loss of sight does not come on till immediately before the fit, and cases have probably been witnessed by most practitioners of experience, in which a patient, either during labor or before it, complains of sudden and complete loss of vision, and in a few minutes, or it may be seconds, is overwhelmed with the most violent eclamptic seizure. The third of the premonitory symptoms of Chaussier, epigastric pain, is of less frequent occurrence than the other two. The suffering is described as being extremely severe, lasting often for hours; and, when it is of unusual severity, it is said to be an almost certain precursor of a convulsive attack.

The convulsive seizure characteristic of true puerperal eclampsia varies so little, save in intensity and duration, that to have witnessed and carefully observed even a single attack will suffice to make one familiar with its main diagnostic features. The following description of the fit is in a great measure borrowed from the essay already alluded to: Probably, after some of the precursory symptoms already described, the patient seems deeply absorbed and preoccupied; then her gaze becomes fixed for a few seconds, and the fit commences immediately by rapid contractions of the muscles of the face, of the eyelids, and of the eyeballs, which seem to roll in their sockets. These twitching movements, which give to the countenance a most painful expression, presently give place to tonic contractions of the same muscles, and of the neck. The mouth is first twisted towards the left, and the face is slowly turned towards the shoulder of the same side. The upturned eyeballs show, through the half-closed eyelids, the inferior segment of the sclerotic. After being slowly turned to the left, the face, by a movement in the contrary direction, turns towards the right shoulder. From the head, the convulsive phenomena rapidly extend to the other parts of the body. The extensors of the trunk, thrown into violent contraction, tend to bend the spinal column backwards (*opisthotonos*). The whole trunk becomes perfectly rigid. The limbs are equally rigid and generally extended. The hands close with force, the thumb being bent inwards upon the palm, and grasped by the other fingers. Occasionally, the predominant action of the flexor muscles has the effect of fixing the different segments of the superior extremities in a semiflexed position, so that the arm sometimes takes the attitude which is given to it to protect the head from a menaced blow. Finally, the diaphragm and the respiratory muscles become involved. Respiration is suspended; the face becomes livid; and the tongue, if projecting from the mouth at the commencement of the fit, is seized and lacerated by the spasmodic closure of the jaws, and the blood, which escapes from the wound thus produced, tinges the saliva which flows from the lips. The muscles of the larynx, and possibly those of the throat, being strongly convulsed, close these orifices. Consequently, the air, compressed by the convulsive constriction of the thorax, can only escape with great difficulty, and produces a peculiar intercepted hissing expiration. There is observed, at the same time, a complete loss of consciousness and of all sensation. The patient neither sees nor hears; and if we pinch or burn the skin, she makes no attempt to withdraw from an irritation of which she does not seem to have the slightest perception.

Clonic convulsions, affecting the whole muscular system, soon succeed the tonic variety. Jerking movements of the head, trunk, and limbs, take the place of the general rigidity of the preceding period. Frightful contortions of the countenance are the result of irregular movements of the mouth, eyelids, and eyeballs. Respiration, which up to this point is almost completely suspended, becomes gradually re-established. The expiratory act is interrupted and stertorous; a frothy, and often bloody foam is forced from between the lips. The movements of the trunk and limbs consist of twitchings, so trifling in extent as merely to move the body without displacing it, so that there is not the same necessity for restraint as in some other convulsive diseases. The pulse, if strong and full at the commencement of the fit, is rapidly accelerated under the influence of the muscular and respiratory disturbance, and becomes extremely feeble towards the height of the paroxysm. It sometimes happens that the contents of the bladder and rectum are voided during the fit, either by paralysis of the sphincter, as some have supposed, or by convulsive action of the diaphragm and of the muscles which form the abdominal walls.

As the fit passes off, all these symptoms progressively decline. The balance of the respiratory and circulatory functions is restored; the color of the surface becomes natural; the movements of trunk and limbs become feebler and less frequent, and finally cease. In a word, the convulsive manifestations of eclampsia may be divided into two distinct periods. The first, which is characterized by tonic convulsions, seldom lasts more than twenty or thirty seconds; the second period, that of clonic convulsions, lasts much longer,—from one to five minutes, or even more. The gradual restoration of the respiratory function during this second period, prevents any special danger to life; and it is, therefore, during the first, or tonic period only, that there is immediate risk. After the fit has entirely ceased, the patient remains in a comatose condition, the depth and duration of which are in proportion to the intensity of the paroxysm, so that the patient may regain consciousness in a few minutes, or after the lapse of many hours. A dull languor, or a confused feeling, with headache, is then very generally complained of, and it may thus be some time before the patient completely recovers. This is, of course, supposing that she has but one attack, or that a considerable interval occurs between them. In extreme cases, the tonic phenomena are such in intensity and duration that the patient's life is at once sacrificed; and, in those cases in which the fits succeed each other with great rapidity, the patient has, as it were, no time to regain her consciousness, and she remains in a condition of complete coma, which is only disturbed by the recurrence of the dreaded paroxysms, and which persists until the case terminates either in recovery or death.

Pathology.—In considering the morbid conditions and the laws which regulate the abnormal muscular action of puerperal eclampsia, we shall confine our observations almost exclusively to the true or uræmic variety, so admirably described by Braun. We have already admitted that cholæmia, and the many varieties of toxæmia, may give rise to symptoms which are apparently identical with those of uræmic eclampsia. In like manner, epileptic patients may, during labor, or at any subsequent stage, be attacked with convulsive seizures, which the previous history of the case, the occurrence of the "aura," and the absence of albuminuria, will enable us, without difficulty, to discriminate. Hysteria, too, may simulate many of the symptoms which have been detailed, but in this case also, the absence of albumen,—with a history of "globus," "clavus," or abundant urine, and an imperfect insensibility during the fits,—should prevent us from falling into serious error. But to enter upon the comparative pathology of all these affections would lead us far beyond bounds, and we must therefore content ourselves by stating, as concisely as possible, what has been established or conjectured in regard to the ordinary or uræmic variety.

That albuminuria and puerperal eclampsia are mutually dependent upon each other, or, at least, are of simultaneous occurrence in the vast majority of all cases, is an assertion not likely, in these days, to be seriously controverted. But it is by no means agreed, as to the albumen and the paroxysm, which is the cause and which the effect. According to Braun, and those who support his views, the albumen appears in the urine as the result of that inflammatory affection of the kidney commonly known as Bright's disease. As a result of this, the blood is poisoned with excrementitial elements of the urine, and especially with urea. The experiments and researches of Frerichs, alluded to in the previous chapter, have conclusively shown that the presence of urea in the blood, even in considerable quantity, does not give rise to eclampsia; and the conclusion which he has reached is, that the active poison is the carbonate of ammonia, produced, as he assumes, by the decomposition of the urea, which must, therefore, be acted upon by some particular ferment, the nature of which has yet to be discovered by the pathological chemist. Frerichs does not admit the essentially inflammatory nature of the disease; at least he appears to do so only to a limited extent, when he assumes, in explanation of the formation of the hyaline tube-casts, that the inflammatory theory can only hold good in so far as the exudation of blood-plasma is connected with a paralytic dilatation of the capillaries. Braun, however, broadly maintains that the disease is of inflammatory origin, and that the nature of the morbid process is identical with that of Bright's disease.

The other theory to which we have referred is that held by those who, while admitting the existence of albumen in the urine as an essential phenomenon, assert that this is the effect of eclampsia, and not its cause, which is, by them, supposed to be the result of some blood disease, or of some blood poison, hitherto unknown to science. Of the two theories we confess to a decided preference for the first, although we can only accept it with some reservation.

We think that Braun is too absolute in his assertion that Bright's disease is *the* cause of puerperal eclampsia. He does not, indeed, deny the existence of the anæmic and other varieties already named, but he gives the latter so little prominence that one is apt to conclude from his description—what, probably, he never intended—that their importance is so little that they scarcely merit notice. No one, obviously, can take a clear and comprehensive view of the pathology of puerperal eclampsia, who does not freely admit that there are cases in which no uræmic poisoning exists. There is, however, we think, no impropriety, in the present state of our knowledge, in employing the term "true," as synonymous with "uræmic," in the nomenclature of puerperal eclampsia. But there is another point, in regard to which Braun seems to have carried his theory too far, or, at least, in regard to which he has failed to prove his case, viz., that all cases of albuminuria are necessarily examples of true Bright's disease. Frerichs's idea on this point seems much more likely to be correct, for, if we do not misunderstand him, he appears to say that, although fibrinous exudation and albuminous urine indicate, undoubtedly, the first stage of Bright's disease, and in that case have an inflammatory origin, it by no means follows that the same symptoms cannot, by any possibility, proceed from other than inflammatory causes.

When the uræmic theory was advanced, it was assumed as possible that, in a large proportion of cases, albuminuria and the consequent succession of pathological changes were due to pressure on the renal veins. This has been, to a certain extent, experimentally proved; and, indeed, it seems to afford the only satisfactory explanation of the rapid disappearance of all symptoms of renal disturbance upon the delivery of the woman; an issue which we could not look for with equal confidence in any other case, unconnected with pregnancy, in which an examination of the urine gave the same chemical and microscopical results. We do not for a moment mean it to be inferred that pressure on the renal veins can account for all cases. On the contrary, it is well known that the symptoms may, although very exceptionally, be developed, either early in the pregnancy or after delivery, when such pressure as is implied is obviously impossible. But we do think that the subsequent history of cases of puerperal eclampsia affords some ground for the supposition that the theory is worthy of more attention than Braun and Lever seem to have accorded to it.

The presence of albumen in the urine is shown very clearly by the ordinary tests, of which the cold nitric acid test is one of the most delicate. By this method a small portion of urine is placed in a test-tube, which, being held at an angle, while strong acid is slowly poured down the side, allows the acid to flow to the bottom. If albumen be present, and the experiment carefully performed, the contents of the tube then show three zones—the upper, clear urine; the lower, clear acid; and the intermediate zone, where the two fluids have mingled, an opaque layer of coagulated albumen. It is unnecessary to detail the various fallacies which are to be guarded against in testing for albumen, as these are now familiar to every clinical student. The observer should not forget that albumen is sometimes present intermittently, and that, therefore, a negative result by the tests is not conclusive evidence of a satisfactory discharge of the renal functions. The cylindrical tube-casts are most easily distinguished, according to Braun, if we examine the fresh urine, about an hour after it has been drawn off by the catheter, withdrawing, by means of a pipette, a few drops of the fluid from the bottom of the vessel. These casts are, however, it should be remembered, necessarily absent in alkaline urine, as they are dissolved in the carbonate of ammonia, which is the product of decomposition of the urea. Very elaborate descriptions are given by Frerichs of the different varieties of tube-casts, but such observations belong more strictly to the pathology of a renal disease than to the explanation of a puerperal disorder. We would direct attention here, further, to two important practical points to which Braun gives a prominent position; first, "The quantity of albumen has generally an intimate relation to the extent, intensity, and duration of acute Bright's disease, but not so constantly to the violence of the eclampsia;" and again, "The more acute the Bright's disease, the darker is the urine, and the more numerous, generally, are the blood-corpuscles."

Morbid anatomy throws no very new nor clear light upon the subject. In fatal cases, which are necessarily the most severe, we would naturally expect to find evidence, more or less distinct, of Bright's disease, in one or other of its stages or forms; but this cannot fairly be held as indicating, with equal certainty, the pathology of those cases in which we venture to assume that the cause consists more in mechanical obstruction than in pathological lesion, and in which, presumably, a fatal result would be less likely to ensue. Probably the result depends, then, in a great measure, upon the extent to which the structure of the kidney has become involved; and if, in fatal cases, the hyperæmic or exudative stage has rarely been observed, we may be sure that it is because these cases usually recover. If, on the other hand, the terminal stage, or stage of atrophy, has been reached, we cannot wonder that such irremediable disorganization should culminate in a fatal result, with or without convulsions. Besides the morbid appearances which are characteristic of lesion of the kidneys, the only observations of importance which have been made are, that the lungs are constantly œdematous and sometimes emphysematous—the result, as is assumed, of the straining of the fits. The spleen is almost always enlarged, but this should not be mentioned as characteristic of the disease in question, as it is well known that enlargement of this organ is very usual, if not invariable, during pregnancy and the puerperal state, associated, probably, with some compensatory changes in the circulation.

Some have supposed that uterine contractions have an important share in the etiology of eclampsia. That the disease may be manifested during pregnancy and after delivery shows clearly enough that this is not an essential condition, even although we may admit it as a possible cause. But, in truth, uterine action is much more likely to be the effect than the cause of eclampsia; for, if there be any truth in the theory—to which some prominence has been given in previous chapters of this work—that deficient aeration of the blood is a cause of uterine action, prematurely or at the full term, we can have no difficulty in admitting that this condition exists, during the paroxysm of eclampsia, in a high degree. "By exciting pains," says Braun, "and increasing their strength, fits cannot be produced at will, nor even aggravated. For we have made the observation, that, under a high degree of reflex sensibility, convulsions cannot be induced at will, at definite periods, by violent irritation of the uterus." We do not doubt this assertion, that fits cannot be produced *at will;* but there are many cases on record of fits being produced, under such a degree of reflex sensibility as is here referred to, by attempts to introduce the hand into the uterus, during labor, for the purpose of turning, or after labor, with the view of removing the placenta; or, it may be, from emotional or other exceptional causes. This may, no doubt, be assumed to be attributable to uterine sensitiveness, but we are inclined to agree, for anatomical reasons, with Dr. Tyler Smith, that the irritation in such cases is more likely to spring from the vagina or the cervix uteri than from the nerves which are distributed to the body and fundus of the womb. On the whole, however, we must conclude that there is a very subordinate relation between uterine pains and uræmic eclampsia.

The maternal and fœtal mortality arising from this disease are subjects of great and obvious interest, since about thirty per cent. of mothers have hitherto succumbed to its effects, direct or indirect. A mortality so large as this must necessarily awaken in the mind an earnest desire for methods of treatment more effectual than any now at our command, and there can be little doubt, that, if the death-rate from this cause is in the future to be materially reduced, it must be by a careful and earnest investigation of pathological theories, and an observation dictated by the same spirit, of clinical facts. The life of the fœtus is certainly to be looked upon, in every case of puerperal eclampsia, as in considerable danger. This fact being admitted, it is by no means agreed as to what is the cause upon which it depends. The stoppage of the circulation in the maternal vessels of the placenta, as suggested by Kiwisch, can hardly account for this; for, were it so, the danger would cease with the fit, whereas, the infant dies in about half of all the cases, and almost always when the symptoms are severe and come on in rapid succession. There is good reason to believe that the actual cause of death in such cases is an extension of the toxic influence from the blood of the mother to that of the child. On this point Braun observes: "If, after numerous uræmic convulsive fits, the child is born alive, a large quantity of urea is found in the blood taken from the umbilical cord; but if it is born dead, we can, immediately after the birth, demonstrate the presence of carbonate of ammonia in the fœtal blood."

It has been said that, next to rupture of the uterus, eclampsia is the most disastrous affection which it is possible for us to encounter in the practice of obstetrics. There are certain questions of prognosis, therefore, in regard to which much anxious speculation must, in such cases, necessarily arise. The points, as already remarked, which chiefly call for anxiety, are an abundance of albumen (when the urine solidifies on boiling), violent fits with short intervals, and profound coma: the converse of these gives good hope of recovery. The dangers, however, of eclampsia depend, in no slight degree, upon the condition of the woman, and especially the period as regards pregnancy, labor, or childbed, at which the symptoms first manifest themselves. When eclampsia occurs during pregnancy, it is almost always during the last three months that the first attack takes place, the viability of the child being in most cases undoubted. It rarely happens in these cases—and then only when the symptoms are moderate—that pregnancy is permitted to go on to its natural term; and this alone, irrespective of toxæmic action, is apt to compromise the life of the child. In one-fourth of the cases, according to Braun, the albuminuria, or rather the uræmic or ammoniacal intoxication of the blood, is sufficient, without the occurrence of eclampsia, to induce premature labor; but, if the convulsive disorder should be developed, the chances of mature gestation and the life of the child are still further reduced.

When rhythmical uterine contractions, and other symptoms, have indicated the commencement of labor before the manifestation of the convulsive phenomena, the effect which is produced upon that process is necessarily watched with much anxiety. In a certain number of cases, the obvious result is an acceleration in the progress of the labor, when delivery is sometimes completed with great rapidity. "The process of labor," says Baudelocque, "in these cases, seems even more rapid than in others, as the child has often been found between the legs of the mother, although, an instant before, no disposition to delivery had been remarked." Inasmuch as no facts have hitherto been recorded which prove that the muscular system of organic life participates in the turbulent action of the muscles of animal life, it seems more likely that the rapid expulsion in these instanees is due rather to deficient resistance in the latter than to abnormal force of the former. It is quite possible, however, that the pains may, by a reflex action upon the nervous centres—surcharged, as Barnes supposes, by an excess of nervous force—excite the expulsive efforts to such an extent as to induce this result. But this is widely different, as will be observed, from a morbid supernumerary force arising from convulsive action. The result of delivery in effecting a diminution in the frequency and violence of the paroxysms is universally acknowledged, and is recognized in practice by the rule which is admitted to be of universal application,—to assist delivery as soon as the condition of the parts indicates that that stage has been reached when the passage of the child may be safely effected.

It is a matter of dispute whether the eclampsia which develops itself for the first time after delivery, is, or is not, more dangerous than the other forms. Theoretically, one would think so, seeing that, uterine excitation and pressure on the renal veins being no longer in operation, the occurrence, under such circumstances, might be held as indicating a more grave constitutional affection. But Pajot, Blot, and others, have strongly deprecated this assumption, and have stated as the result of their experience, that in these cases, the issue is on the whole more satisfactory. In those instances in which fits have come on before delivery, the completion of labor, although it usually produces a marked amelioration of the symptoms, by no means places the woman out of danger. It has been observed by Blot that, putting aside the danger of repeated attacks of eclampsia, there is in such cases a special tendency to post-partum hemorrhage; and others have noticed that there remains a proclivity to the various inflammatory affections to which a parturient woman is liable, such as uterine phlebitis, peritonitis, pelvic cellulitis, and the like, the occurrence of which is obviously favored by the derangements of the circulatory system which repeated attacks of eclampsia necessarily engender.

Treatment.—The earliest stage at which the question of treatment may offer itself for our consideration, is when the symptoms during pregnancy are such as to cause serious apprehension of an impending explosion. The most important of these are albuminuria, tube-casts in the urine, and œdema. Although a complete cure of albuminuria is very rarely obtained during pregnancy, so long as the pressure is maintained on the renal veins, something may, no doubt, be done in the way of moderating the disease, and preventing its passing into its higher and more incurable grades. It is, at least, possible, by the administration of ferruginous tonics and by a liberal diet, as recommended by Cazeaux, to ameliorate a watery or otherwise deteriorated condition of the blood, and a good general effect is often produced by the use of tepid and vapor baths. In order to prevent decomposition of the urea in the blood, or to neutralize the carbonate of ammonia already formed, it was suggested by Frerichs that tartaric acid, benzoic acid, or lemon-juice should be regularly given, a recommendation which, although it has not yet received the assent of some eminent physicians, must be looked upon with interest as the necessary corollary to that author's proposition as to the pathogenesis of the disease. In every case, the function of the bowels should be carefully regulated, but purgation as a prophylactic measure, although strongly recommended by some, must be resorted to with caution, as there is a risk of thereby reducing the strength, which is already enfeebled. The quantity and microscopic conditions of the urine afford the best indications as to the necessity which exists for the use of diuretics. Braun recommends that when exudation has taken place into the Malpighian capsules, and the tubuli of Bellini and Ferrein, the cylindrical clots must be removed from them, and the formation of new ones prevented. If the current of fluid proceeding from the vascular knot of the Malpighian bodies into the Malpighian capsules be strong, then the copious use of diluents is sometimes alone sufficient to wash away the cylindrical clots, and recovery ensues. But, if the secretion of urine be very scanty, and uræmic intoxication threatens to come on, then the force of the current proceeding from the Malpighian bodies must be increased, and the cylindrical clots removed, for which purpose the acids (above mentioned), and the mineral waters of Selters and Vichy are best adapted. According to the example of Frerichs, pills of tannin and extract of aloes are to be used for restoring the normal tone.

It has been proposed, with the view of obviating eclampsia and its dangers, that premature labor should be induced. Tarnier recommends that this should be done before the symptoms become urgent; but we think that Braun's view is decidedly more judicious, when he insists that labor should only be provoked when the symptoms are such that the life of the woman is in imminent danger. When the child is already dead, we are, of course, more justified in having recourse to this measure. When labor comes on without eclampsia, it has been recommended by Chailly that chloroform be employed, with the view of warding off the attack.

In the treatment of eclampsia, in which the explosion has already taken place, our mode of procedure must necessarily differ, according to the period—pregnancy, labor, or childbed—at which the fits develop themselves. But, as regards the treatment during the paroxysm, the indications are the same in all cases, and consist mainly in doing what we can so to act upon the nervous system as to moderate central irritability, and reduce peripheral or reflex excitability to a minimum. It is but a few years since all cases of eclampsia, with the exception of the anæmic and hysterical varieties, were treated upon one and the same principle,—that being free general bloodletting. The facts, however, which modern pathology has disclosed, have completely altered the plan of treatment. Perhaps, in some quarters, the rejection of the lancet has been too absolute. Indeed, we rather incline to this belief; for there are cases in which the constitution and temperament of the woman, along with the violence of the attack, might lead us, not unnaturally, to suppose that venesection would afford the best chance of recovery. Still, it must be confessed that indiscriminate bleeding was a monstrous error, and that it would be better to do nothing at all than to bleed without selection of cases. Those who, in the present state of professional opinion, shrink most from the idea of the lancet, may, at least in suitable cases, apply leeches freely to the temples.

A remarkable effect is produced, in many cases of puerperal eclampsia, by the administration of chloroform, ether, and other anæsthetic agents—an effect which, in some instances, quite surpasses our expectations. The approach of a repeated paroxysm, or symptoms such as make us dread the commencement of a first seizure, are a sufficient warrant to adopt this method of treatment. Respiration being much impeded, as we have seen, during the fit, it is proper at that time to withhold the chloroform, so as not in any way to interfere with the function of respiration while the aeration of the blood is already so seriously interrupted. Anæsthesia, however, often has the effect of holding in subjection the premonitory symptoms, and so long as this result is undoubted, we may keep up the effect until the patient falls asleep, or the approach of stertor shows that the action of the drug can be safely pushed no further. When chloroform—which is the agent usually employed—fails to avert convulsions, it has very generally the effect of modifying them; and we may infer that, by its action on the muscles of the mouth, throat, and larynx, the danger of suffocation, during the period of tonic spasm, is materially diminished.

The hydrate of chloral is another anæsthetic agent, which has of late been strongly recommended. The sedative and narcotic effects of this drug are well known, but it is not so generally understood that when it is pushed further, it produces an anæsthetic effect, under the influence of which a woman may be delivered without experiencing the slightest suffering. We can, without hesitation, corroborate much of what has been advanced of late in regard to the marvellous effects of this drug in the treatment of convulsive diseases. When given in what we may call ordinary sedative doses,—not more than thirty grains,—its effect is safe, and in most cases efficacious; but, should we think of giving larger and repeated doses, we should bear in mind, that very alarming symptoms are occasionally produced, and that death has even been the result of what we might consider quite an ordinary dose. A number of cases have been of late recorded in proof of the efficacy of chloral in eclampsia. We extract the following from the Gazette des Hôpitaux of Feb. 22, 1873: "A woman of twenty-one, pregnant for the first time, who had suffered for fifteen days from œdema of the lower limbs and of the eyelids, from headache, somnolence, great weakness, and frequent calls to urinate, was admitted to the hospital of La Charité, under the care of M. Bourdon. On her admission, a large quantity of albumen was discovered in the urine. Three days passed without any appreciable change in her condition; but, on the fourth day, a violent attack of eclampsia took place, which lasted for ten minutes. During the period of resolution, an enema containing four grammes (a little more than one drachm) of hydrate of chloral was administered, after which the patient almost immediately fell asleep. At the visit, on the following morning, labor had not commenced. Foreseeing the probability of a renewed attack, M. Bourdon had two injections prepared, each containing four grammes of chloral. The first was administered at ten o'clock in the morning, just as labor had commenced. The second was given two hours afterwards. At three o'clock the labor terminated, without the woman having experienced the slightest pain. On the evening of the birth a second eclamptic attack took place. A draught containing four grammes of chloral was at once administered; she had a quiet night, and no fresh attack took place; the œdema rapidly disappeared, and the patient left the hospital fifteen days afterwards."

The effects of chloral are further illustrated in a remarkable thesis by M. Charpentier,[1] in which he contrasts the effects of the various remedial agents which, up to this time, have been employed in the treatment of eclampsia. He, more particularly, compares the results of treatment by the old method of bleeding and the modern plan of anæsthesia, with the following striking result, which we quote, however, with the reservation applicable to obstetrical statistics in general:

Mortality in cases treated by bleeding, ... 35 per cent.
" " " anæsthetics, . . . 11 "

We must carefully avoid, moreover, the danger of adopting any particular method of treatment to the exclusion of others. If we admit that throbbing carotids, and marked suffusion of the eyes and face after the subsidence of the fits, are exceptional symptoms, warranting bloodletting, we may, in like manner, concede, that ice to the head may, in similar cases, be beneficial. Dashing the face and surface with cold water during the fit, as recommended by some, is always to be avoided; for it is quite obvious that an excitation of this kind is likely to be followed by reflex convulsive phenomena. Sponging with warm water, or tepid vinegar and water, has been found useful; and this is also the case with regard to opium, which has been freely administered, both by the mouth and by enema, in cases in which the other methods of treatment have not operated with sufficient rapidity.

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[1] De l'influence de divers traitement sur les accès éclamptiques. Paris, 1873.

What may be called the obstetrical treatment of eclampsia involves a more particular reference to the stage at which the seizure occurs. The cases in which we would be justified in inducing premature labor are very exceptional; for it must be remembered that the usual effect of eclampsia is to bring on labor, so that we need not interfere in the process. Still, there are cases where the gravity of the symptoms may call for prompt and decisive action.

In eclampsia occurring during labor, our mode of procedure must, of necessity, be regulated entirely by the stage of the process which has been reached. There are, however, two preliminary points which it is necessary to have in view throughout: 1st, that, on account of the extreme irritability of the nervous centres, we should avoid, as far as possible, all sources of reflex irritation, and, above all, any unnecessary manipulation or digital examination; and 2d, that although we recognize the importance of speedy delivery, we must be extremely careful, in adopting operative means for accelerating the process, to choose, if it be practicable, those only which are least likely to excite increased muscular action, whether of the voluntary or involuntary muscles. If the os is still closed and rigid, bloodletting is well known to have a decided, and, indeed, remarkable effect; and this, perhaps, is the stage, above all others, at which, if the other symptoms do not forbid it, we are most likely to deem that measure advisable. If not, we content ourselves with cold applications to the head, and at the same time, by means of chloroform or chloral, attempt to allay the nervous irritability while we await the result of the natural process of cervical dilatation. If the pains are inefficient, and the labor promises to be tedious, the safest method of acceleration is to introduce an elastic catheter, in the manner described in a previous chapter.

When the os is already partially dilated and dilatable, the treatment which is now recommended by almost all the best authorities, is to rupture the membranes, and, after thus permitting the escape of the waters, narrowly to observe the subsequent stages of the process. Forcible dilatation of the os (*accouchement forcé*) is a method of procedure which can scarcely be admitted as warrantable under any circumstances, and the same observation applies to the incision of the soft parts after the method recommended by Baudelocque. When the os is dilated, and the stage, consequently, has arrived at which the forceps may easily be applied, we hold the blades in readiness for immediate use; but, even here, if the parts are anatomically in a favorable condition, it is better to leave the case for a time to nature. When the head has passed downwards in the pelvis, and is pressing on the perineum, we need have little hesitation in using the instrument, should the condition seem urgent, or the labor begin to flag. The operations of turning, or of craniotomy, should never be entertained, unless in the presence of malpresentation, or pelvic disproportion, when the rules applicable to these complications must be observed. After delivery, it is advisable that the removal of the placenta should not be long delayed, and the accoucheur should pay particular attention to the contraction of the uterus and the removal of clots.

Should the convulsions persist after delivery, or should they then come on for the first time, full doses of opium or chloral, with cold to the head, perfect rest and quiet, and the emptying of the bowels, if necessary, by a simple enema, are the main points to be attended to. It is very unlikely that at this stage bleeding would be held to be advisable, but it is possible that some benefit might be derived from ligature of the limbs, by which a large quantity of blood—thirty ounces, according to Vogel—may be temporarily withdrawn from the circulation; but this is a process in regard to which we must learn more before we can be confident as to its results. When the convulsions present the character of hysteria, or are of the so-called anæmic variety, the treatment must, of course, be modified, in the one case, by the addition of the familiar antispasmodic remedies, and, in the other, by the administration of stimulants with, subsequently, generous diet and tonic restoratives.

CHAPTER XLIII.

PUERPERAL FEVER.

PERPLEXING NATURE OF THE SUBJECT—NOMENCLATURE AND CLASSIFICATION: METRIA: PUERPERAL FEVER; VARIETIES OF: PERITONITIS IN ITS RELATION TO PUERPERAL FEVER—CAUSES: EXISTENCE OF A PUERPERAL POISON: CONDITIONS WHICH FAVOR ITS PROPAGATION: CONNECTION BETWEEN THIS AND OTHER ZYMOTIC INFLUENCES; ERYSIPELAS, SMALL-POX, SCARLET FEVER, ETC.—IT IS UNDOUBTEDLY CONTAGIOUS; PROOFS OF THIS—CERTAIN PREDISPOSING CONDITIONS—PUERPERAL PERITONITIS; MAY EXIST INDEPENDENTLY OF PUERPERAL FEVER: SYMPTOMS OF AN ORDINARY ATTACK; OF THE MORE SEVERE FORM—FALSE PERITONITIS—ACUTE TYMPANITES: SYMPTOMS AND PROGRESS—PUERPERAL METRITIS; OF LESS FREQUENT OCCURRENCE: SYMPTOMS—UTERINE PHLEBITIS: SYMPTOMS AT FIRST OBSCURE: SECONDARY ABSCESSES IN THE LATER STAGE: TISSUES CHIEFLY INVOLVED—VAGINITIS; STHENIC AND ASTHENIC—INFLAMMATION OF THE UTERINE LYMPHATICS.

EVERY one, without exception, upon whom the duty of writing a systematic treatise on obstetrics has devolved, seems to have recognized in the subject of this chapter the most difficult and perplexing part of his task. Nor does a thorough acquaintance with the literature of the subject relieve him in any marked degree from the difficulties which are before him. On the contrary, indeed, he finds that the more he reads on the subject, the more earnestly he attempts to reconcile conflicting statements, and to decipher a hundred different schemes of classification, so as to harmonize the whole, the more hopeless seems an egress from the maze of mingled theory and fact. There is one point which, at a very early stage of the investigation, can scarcely fail to become apparent to the student—that the phrase "Puerperal Fever," has been employed very loosely, to designate special groups of cases which differ from each other in many essential particulars. But, however anxious he may be to adopt a more precise nomenclature, he will find this so difficult, that he will, in all probability, as most others have done before him, abandon the attempt.

One or two of the difficulties to which we refer may here be shortly alluded to. It is admitted on all hands that puerperal fever is commonly associated with very violent inflammatory action, which may affect various tissues, the peritoneum oftenest of all. On the other hand, the peritoneum may become the seat of inflammation, apparently of local origin, running its course as it would under ordinary circumstances, the symptoms only being modified by the peculiar condition in which the woman happens to be placed. In the latter case, as we may suppose, she recovers; in the former, she dies. How far, then, it may be asked, is peritonitis an essential factor in the production of puerperal fever? or how far is the term "puerperal peritonitis" to be accepted as synonymous with "puerperal fever?" Again, we peruse accounts of two or three different epidemics of what is assumed to be puerperal fever, by men whose high reputation and recognized powers of observation are the most perfect guarantee of their good faith. Each depicts a febrile disease of the puerperal period; but the symptoms, far from harmonizing, present the most perplexing, and even startling, contrasts. Are we then painfully to collate such facts, and by describing a multiplicity of varieties, draw attention to points of contrast more than to features of resemblance? Or, finally, we find one author asserting that, under the most heroic use of the lancet, almost all his cases recovered; a second has observed that, when bloodletting was practiced, almost every case died; while a third describes, under the name of puerperal fever, an affection so trifling that it was usually checked by a single dose of Dover's powder. Are these cases really of the same nature—we ask in excusable bewilderment—or are they the same in name only? It were easy to multiply questions of this kind, which meet us on every hand, as we follow the narratives of recorded facts; but enough has been advanced to show, with sufficient clearness, the perplexing nature of the subject which we have now reached.

The more carefully one examines the whole matter, more especially if with a desire to secure a comprehensive grasp of the subject, the more apparent does it become that it is necessary to group together, under one head or generic designation, the greater number of the inflammatory and febrile affections of the puerperal state. It was this feeling, we presume, which led to the adoption by the Registrar-General of the term "Metria," under which head that functionary ranges all cases of death from the acute affections of the puerperal state. We have, however, after consideration, adopted the more familiar designation of Puerperal Fever, for reasons, and with restrictions as to its meaning, which it is now proper to explain. By adopting the singular number, and thus giving to puerperal fever the most comprehensive signification possible, we have no wish to elude the necessity which exists, if we would be intelligible, of giving to the term, if not the final exactness of a definition, at least something more of precision than can be otherwise attained.

By puerperal fever, then, we understand a disease belonging to the so-called Zymotic class, the proximate cause of which is some peculiar poison to which lying-in women are liable by contagion, or which is, under certain circumstances, developed in the puerperal state. The type, and, as a consequence, the symptoms of the disease, vary considerably; but the poison, of the nature of which we are as yet perfectly ignorant, is an essential factor in its causation. We need not wonder, in regard to the history of different epidemics, that the symptoms show considerable variety, for, in the analogous case of typhus fever, and in other disorders belonging to the same class, it has long been a recognized fact that epidemics have their individual characteristics—that in one, for example, we have a tendency to thoracic, in a second to enteric, and in a third to cerebral disturbance. We know nothing for certain—absolutely nothing—of the cause from which such variations spring; and there is, therefore, no call for surprise when we recognize, in the case of puerperal fever, instances in which peritonitis is the leading symptom, in others metritis, in others phlebitis, and, in the most fatal class of all, sudden collapse from the intensity of the poison, without any inflammatory or local lesion being discoverable after death.

We quite admit the force of an objection which some would here interpose, that the theory of a specific poison is by no means necessary to all cases of puerperal peritonitis, and especially to the slighter varieties of this and other inflammations. But while we admit that the protest is well founded, and that cases of peritonitis are not *necessarily* cases of puerperal fever, we do not recognize in the admission any warrant for separating puerperal peritonitis from puerperal fever, in any scheme of nosological classification which we might adopt. According to all observers, peritonitis is the most frequent of all the lesions which accompany puerperal fever; and this is more particularly shown in the result of 222 dissections made by M. Tonnellé, who found that, of that number, 193 presented decided evidence of peritonitis. The morbid poison upon which the fever is presumed to depend may be generated in various ways—by contagion, and by the operation of other septic agents, such as the poisons of typhus, erysipelas, and the like; but so associated are its phenomena with the inflammatory affections which we have noticed, that to separate them tends only to the further complication of the subject. And there is this very significant fact to be noticed, that although a simple inflammation of the peritoneum, or of the womb, may run its course without the development of the more characteristic symptoms of puerperal fever, it invariably happens that when those inflammations pass into the graver and more fatal stages, the symptoms then manifested are apparently identical with the most familiar types of the ordinary childbed fever. If, therefore, we were forced to admit that the local inflammations referred to were causes of puerperal fever, and that the zymotic influence was developed in their progress, so far from this being recognized as a reason for disassociating the two affections, it should, to our mind, be admitted as an apology for admitting the intimate connection which subsists between them.

Some writers, and especially those of the French school, who have taken a similar view of the case to that which is here expressed, have gone to the other extreme in refusing to admit of local inflammations as affections which may possibly exist unconnected with true puerperal fever,—an idea which, if generally admitted, would give rise, in some cases, to unnecessary apprehension. It is from this error, indeed, we believe, that the discrepancy sprung, as to the details of symptoms and the result of treatment, which has tended, more than anything else, to veil the subject in obscurity. For, if simple local inflammation, and the more malignant forms of the fever, are held to be identical, we can readily understand how the observations of one writer, who has chanced in his experience on the less serious disorder, cannot be made to tally with those of another who has had to deal with a malignant and fatal disease. Puerperal fever, then, as embracing various disorders in themselves apparently distinct, is, in this wider sense, a term obviously open to objection. Indeed, we confess to having entertained a preference for confining that designation to its more fatal, asthenic, or typhoid type, until, on carefully reading the description given by those who have followed this plan, we recognize the utter impossibility of thus conveying in an intelligible form a correct appreciation of the different groups of symptoms, in their relation to the insidious animal poison around which the interest of the subject naturally centres.

Causes.—From a strictly philosophical point of view, it may, perhaps, be said that we know little of the causes of puerperal fever. We know, indeed, that the disease manifests itself only in women in the puerperal state. We confidently assume, that it is due to a peculiar poison, of the nature of which, in so far as chemical or other demonstration is concerned, we are profoundly ignorant. But the history of epidemics, and the valuable contributions which have, from time to time, been made to the practical elucidation of the subject, show that, since puerperal or childbed fever was first imperfectly described, upwards of a hundred and fifty years ago, many difficulties, theoretical as well as practical, have been surmounted, with the gratifying result that the mortality from this cause has of late years been very materially reduced. The progress which has been made in this direction is due, not so much to discoveries in regard to the puerperal poison, its origin, and its effects, as to the more advanced knowledge which modern hygiene has developed in regard to the laws regulating the manifestations and spread of zymotic diseases generally.

It has thus been made manifest that all epidemic and contagious diseases are more susceptible of propagation under certain circumstances. Defective ventilation, and unfavorable conditions of cleanliness, drainage, and the management of effluvia, have all been shown to encourage the advance of cholera and typhus, as well as of puerperal fever. That is to say, these conditions favor the spread of zymotic diseases once generated. The aggregation of patients in lying-in hospitals of defective construction is now recognized, only too clearly, as a cause of increased maternal mortality. And the bold and startling disclosures of the late Sir James Simpson, in his papers on Hospitalism, have also called attention to the fact that the death-rate in all hospitals, even under the most favorable sanatory conditions, is perceptibly increased. But if, in the case of lying-in hospitals, the poison of puerperal fever should once become developed, the scourge operates with such dreadful effect that something more than decimation of parturient women has not unfrequently been the result.

A series of facts of surpassing interest seem to show that the puerperal poison may be developed from other poisons of a similar kind,—which has led some to conclude that the cause is less specific in its nature, than a septic influence operating upon the peculiar conditions of the puerperal state. One or two examples, illustrative of this proposition, may be adduced. A patient was admitted, by some oversight into the wards of the Dublin Lying-in Hospital, while laboring under typhus fever; but the error having been discovered, she was removed in a few hours. In the beds on the right hand and the left of this woman were two lying-in women; both were attacked with puerperal fever, and both died. "In another case," says Dr. Tyler Smith, "a medical man was in constant attendance upon a patient suffering from gangrenous erysipelas, and, between the 8th of January and the 22d of March, attended the labors of ten women; all had puerperal fever, and eight of the patients died. This was in a town of moderate size, and no other patients in the place were known to have had puerperal fever. A remarkable instance, to the same effect, is related by Dr. Ingleby. Two practitioners attended a post mortem, where the patient died from this disease. The first was summoned, in one direction, to a midwifery patient, who was attacked with puerperal fever; the other attended two cases in succession, both of whom were seized with the same disease." Nothing, perhaps, is more clearly recognized, in regard to the etiology of the disease, than the great danger which a woman incurs, who, during the puerperal period, is exposed to the contagion of scarlet fever. Although, during the continuance of pregnancy, nature seems to throw a mantle of protection around a woman, in so far as ordinary contagious influences are concerned, she is no sooner delivered than she becomes remarkably susceptible; and, when attacked, whether the disease be typhus, scarlet fever, or even measles, the symptoms often assume the fearful characteristics of puerperal fever. Small-pox, contracted under similar circumstances, is well known to be almost certainly fatal. The enormous mortality which at one time prevailed in the Lying-in Hospital of Vienna, gave rise to the belief that the disease was propagated by means of poison communicated by students who had recently been engaged in dissection, and the observations of Dr. Semelweiss strongly corroborate the supposition. It seems to us, however, that this has been considerably exaggerated as a means of generation of the poison, as the evidence upon which the assumption rests is derived mainly, though not entirely, from lying-in hospitals. Medical students are proverbially careless in these matters, unless they are under strict supervision; but it is somewhat strange that experience during many years in the management of a large lying-in charity, where the women are delivered by students and midwives exclusively at their own homes, has failed, in our own, and many other similar cases, in recognizing any such marked septic influence as Semelweiss would have us anticipate. That the cadaveric poison has, undoubtedly caused puerperal fever, is, however, quite enough to demand from every one the strictest precautions which can be devised, in order to avert so dreadful a calamity.

The above, and other similar facts, show that the poison of which we speak is associated with others of a similar nature. Attempts have, indeed, been made to prove that the poison of erysipelas is identical with that of puerperal fever; and, although it is too much to assume that this has been made out, there can be no doubt that either affection is capable of being generated from the other. But there is another consideration arising from a review of these cases,—the question of contagion; and, although there are probably few who do not admit that puerperal fever is in the highest degree contagious,.the eminence and authority of some of those who have maintained a contrary view is sufficient to call for a brief notice of this point. In proof of our conclusion,—which is the general belief,—and in addition to the facts above mentioned, we may add the following from the same source. "Two medical men, brothers and partners, attended, in the space of five months, twenty cases of midwifery. Of these, fourteen were affected with puerperal fever,—a fatal result ensuing in eight cases. The only other known death from puerperal fever, in the same town, within the period named, occurred in the case of a patient attended by a medical man who had assisted at the post mortem of one of these puerperal patients. After this disastrous period, the two brothers relinquished all their midwifery engagements for one month, in which time five of their cases were attended by other practitioners, and no instance of fever occurred in the course of that month. They then returned, and several fatal cases again happened. . . . Dr. Roberton, of Manchester, relates, perhaps, one of the most cogent instances of contagion and fatality on record. In the space of one calendar month, a certain midwife attended twenty cases belonging to a lying-in charity; of these, sixteen had puerperal fever, and all died. The other midwives of the same charity, working in the same district, attended, in the same time, 380 cases, none of whom were affected with puerperal fever. In another large town, containing many thousands of inhabitants, and numerous medical men, fifty-three cases of puerperal fever occurred. Of these, no less than forty happened in the practice of one medical man and his assistant."

If these facts do not suffice to establish beyond all question the doctrine of contagion, we would refer the reader to the works of Gooch, Routh, and Semelweiss, for evidence which appears to us to be unanswerable. Those who oppose the contagious view, attempt to account for such facts as have been quoted by exaggerating the importance of epidemic influences. That epidemic and atmospheric influences bear upon the question we do not dispute, but that these will enable us to account for such cases as have been mentioned we cannot for a moment believe. The well-known occurrence of sporadic cases has also been urged against the doctrine of contagion. It is, however, so easy to account for such cases, by the relation proved to exist between various animal poisons, that we may pass this subject by without further comment. There are other influences which may well be assumed to have some share in the manifestation of the disease,—such as the general health, temperament, and constitutional vigor of the patient, and the circumstances under which she is confined. It has been repeatedly noticed that depressing mental emotions exercise a very marked effect, so that women who have been seduced are more prone to the disease than others. "Several of the worst cases I have seen," observes Dr. Churchill, "were mainly attributed to this cause."

Were we even to confine our attention to the malignant variety, which all unite in calling Puerperal Fever, we would find it perfectly impossible to give any useful description, without a full recognition of the fact that such cases present themselves under different forms. But, taking the term in its more comprehensive sense, the necessity for classification becomes even more apparent. The system which we shall adopt is a purely arbitrary one, and is, no doubt, quite as open to objection as are all others hitherto advanced. We would only repeat, in case of misapprehension, that, in discussing the affections alluded to, we should prefer, if it were convenient or even possible, to call them "post-partum inflammations" in the first stage, but, as this would only give rise to confusion, we are content to sacrifice nosological accuracy to simplicity and intelligibility.

Peritonitis—Puerperal Peritonitis.—This, as the most frequent and familiar accompaniment of puerperal fever, is the affection which naturally is the first to attract our attention. Inflammation of the peritoneum may, as we have said, exist and run its course without any manifestation of symptoms indicating the operation of a morbid poison, in other words, puerperal peritonitis may exist as an affection distinct from puerperal fever. In some cases it affects a small portion only of the membrane in the pelvic region; when it may give rise to a more chronic affection (Pelvi-peritonitis), which will fall to be considered in a subsequent chapter.

An ordinary attack of peritonitis almost always comes on within a week of the period of delivery. The patient is seized with a rigor, of greater or less severity, followed by heat of skin, acceleration of the pulse, and other febrile symptoms. At the same time, the patient complains of pain in one spot—usually in the pelvic region—whence, if violent in degree and unchecked, it may pass over the whole of the abdomen. Imprudence during the period of convalescence may no doubt lead to the development of simple peritonitis, but this is less frequently the case than we might have anticipated. The sooner after labor the symptoms are manifested, the more serious is our prognosis as to the issue of the case; and, in a large proportion of cases, if not checked by appropriate treatment, it is apt to run rapidly to a fatal termination. That portion of the abdomen which is the seat of the inflammation has often been observed to be swollen and tumid. The pulse is quick, wiry, and incompressible, and rises in frequency as the inflammation extends; the tongue is not usually much altered in the early stage. Nausea and vomiting are of frequent occurrence as the disease progresses, and the swelling and tumefaction of the belly become more marked. The bowels are obstinately costive, and the patient lies on her back with her knees drawn up.

To this, if the symptoms are unchecked, succeeds a second stage, which it is impossible to distinguish from one of the most familiar forms of puerperal fever. There is now a decided change in the character of the symptoms. The pulse, although it loses nothing of its rapidity, and may even become more rapid, changes in character from the inflammatory to the asthenic type. There is a marked alteration in the countenance, a pitiful appearance of ghastly distress. The belly swells still further and becomes tense, with great aggravation of the suffering, so that the patient can now no longer bear even the pressure of the bedclothes. If the lochial discharge has not been previously arrested, it now becomes fetid, and the breasts become flaccid. The tongue is dry and often furred, and the unhappy patient suffers from excessive thirst. The violence of the vomiting in some degree subsides, but the patient is now attacked with diarrhœa, which is often violent and uncontrollable. The extremities become cold; the surface of the body is bedewed with a clammy perspiration; and low muttering delirium sets in. With these symptoms, or even at an earlier period, there is a remission or cessation of the pain, which sometimes gives rise to fallacious hopes in the mind of the patient and her friends. Hiccup, picking of the bedclothes, and delirium are the immediate precursors of death. Occasionally, a rapid metastasis of the inflammation takes place, even after an abatement of the symptoms have led us to hope that the danger had passed. The inflammatory process may thus blaze out afresh and with equal violence—in the pleura, for example; and we have known a second metastasis take place—first to one pleura, and subsequently to the other.

When a case goes on to this more advanced stage, it is difficult to say, with any approach to certainty, whether it is to be regarded as, from the first, an example of puerperal fever. Whether it be so or not seems a matter of very secondary importance, if, in the end, the symptoms of the two are identical. Nor is it of any great moment to determine where the one variety ends and the other begins. If we recognize fully the fact, that the puerperal poison may be generated from so many various sources, may we not assume it as probable—to say the least—that it may be developed in the course of an inflammatory disorder, which is so frequently its accompaniment? There is every reason to believe that peritonitis is contagious—in its second stage at least—and, if we are correct in this assumption, it can serve no good practical purpose to split hairs as to the identity or non-identity of affections which we must treat on the same principles, and in regard to which we must observe the same precautions.

When puerperal peritonitis occurs in the epidemic form, the symptoms, although essentially the same, are in every respect greatly aggravated. We may express this differently by calling it that form of puerperal fever in which peritonitis is the leading symptom. Here the symptoms are, from their earliest development, of a violent, if not of a malignant type. The pulse is, from the first, extremely rapid and thready, about 140 in the minute, and destitute of any force. Instead of there being constipation—which is the prevailing characteristic of simple peritonitis—diarrhœa at once sets in, and the case, thus passing over, as it were, the initiatory stages of the disorder, plunges the patient at once into a state from which recovery may seem to be all but hopeless. The form is of a low type from the first, and the abdominal tumefaction commences at an earlier stage. It has also been remarked, that in this variety the pain begins in the region of the diaphragm, and radiates from that point, instead of from the pelvic region, over the whole peritoneal surface,—and that with much greater rapidity than in the other form. It would appear, also, that in the more serious form, there is a remarkable difference in the exudative effects of the inflammatory action. In ordinary peritonitis, adhesive lymph is poured out, as an attempt at reparation on the part of nature, barring the further progress of the malady by gluing the parts together. But, in the more serious and fatal form, which has its origin in contagion, the lymph is not adhesive, the inflammation is not circumscribed, and both Hulme and Leake have found that in these cases the peritoneum is softened to such an extent that it actually seems gangrenous.

False Peritonitis — Acute Tympanites. — We place these affections together, not from any idea of their identity, but because they are conditions which may seriously embarrass the practitioner who may not be aware of the possibility of their occurrence, or, what is worse, may lead him, through a false diagnosis, to adopt methods of treatment which are the reverse of beneficial. The term, False Peritonitis, implies necessarily abdominal pain which is not inflammatory in its origin, and which is, in all probability, due, either to intestinal irritation, or to some neuralgic affection of the abdominal walls in consequence of overdistension. The severity of the pain, the acceleration of the pulse, and the other constitutional symptoms to which it gives rise, may lead, very possibly, to a hasty conclusion that true peritonitis is the disease with which we have to deal. It would seem, however, from the description given by Dr. Fergusson of a malady which came constantly under his notice in the year 1827 and the early part of 1828, and to which he gave the same name, that this comparatively trivial affection may possess something of an epidemic character, although it may be relieved by the simplest remedies. The treatment which has been found most efficacious is the administration of a full opiate.

The name, Acute Tympanites, was given by Dr. Ramsbotham to an affection which he himself had frequently observed, which he believed to be a variety of the *intestinal irritation* of Marshall Hall, and which is particularly interesting in this respect, that it very closely resembles ordinary puerperal peritonitis—so closely, indeed, that, to judge from the description given by Dr. Ramsbotham of the symptoms, it must be a matter of no small difficulty to distinguish the two affections. "The attack," says he, "mostly commences two or three days after delivery, and is usually introduced by a rigor; this is often very severe—more so, indeed, than when it precedes peritoneal inflammation. It is a great mistake to believe that shivering is always indicative of the commencement of an inflammatory attack; for here, although not the slightest appearance of inflammation can be observed after death, the rigor is generally strongly marked. To this succeed great heat and dryness of skin, which also is often more intense than in peritonitis. I have already said that in peritoneal inflammation the surface is sometimes soft and moist from the commencement; but this I never remarked in the affection now under consideration. The pulse rises rapidly in frequency, often beating one hundred and thirty or one hundred and forty strokes in a minute; sometimes it is fluttering and tremulous; at others, fuller and firmer than in peritonitis. The mouth is generally dry; the tongue occasionally furred, or it is harsh and red. The countenance becomes early changed, though not so anxious as in peritonitis. Most severe pain in the head is experienced, with intolerance of light and noise, uninterrupted wakefulness, and, in many cases, even delirium. Very early in the disease, the abdomen swells inordinately and rapidly, becomes very tense and painful, and the transverse colon, particularly, can in many instances be distinctly traced: pressure aggravates the suffering. The milk ceases to be secreted; the lochia are generally suppressed; there is great languor; an unwillingness to speak or take nourishment; the patient lies on her back with her legs drawn up, unsolicitous about herself, her infant, or her friends; the bowels are obstinately constipated. As the disease gains ground, the belly increases in size, pain, and tightness; the tongue becomes dry and brown; there is hiccup or vomiting of offensive matter, muttering delirium, subsultus tendinum, and most of the symptoms that denote the last stage of fever; but if recovery is to be expected, the swelling and tenseness of the abdomen subside; the pain gradually goes off; the pulse becomes slower; the tongue moister; the skin cooler and softer; there is no vomiting; the intellect remains unimpaired; a desire is expressed for food, and the bowels act, together with the expulsion of a large quantity of flatus."

To distinguish between peritonitis and tympanites, in the presence of such symptoms as have just been detailed, must puzzle the most astute observers. The only points, indeed, upon which we could rely would be the history of the case; as in the former affection we would expect pain first and swelling afterwards, while, in the latter, there is an early and rapid gaseous distension, which is the cause of subsequent pain. We incline to the belief that Dr. Ramsbotham has given too much prominence to this affection as an independent puerperal disorder.

Puerperal Metritis.—This is an affection which, uncomplicated, is of much less frequent occurrence than peritonitis. Hysteritis, or Metritis, under the ordinary childbed conditions, involves the idea of an acute inflammation, attacking tissues which are the seat of a very peculiar process of involution, a part of the physiological phenomena of gestation. In a chronic form, it is by no means of unfrequent occurrence; but, under such circumstances, the result is not usually fatal. In the acute form, however, it has been observed to be very fatal, and to terminate, as in the case of peritonitis, with all the horrors of puerperal fever. In the mode of access, it does not differ materially in its symptoms from peritonitis. The pain, however, is in this case referred more particularly to the hypogastric region, where the uterus may be distinguished, of larger size, and sometimes harder, than is usual at the period. On a digital examination by the vagina, the nature of the case is still further revealed, by the heat and tenderness of the os uteri. This has been much more frequently observed as a consequence of severe or protracted labor than the peritoneal variety; and, in those cases in which a fatal result has ensued, extensive disorganization of the uterine tissues has been remarked.

That an inflammatory affection, having its seat in the tissue proper of the uterus, may occur in childbed, we cannot dispute. But it may well be doubted whether many of the cases which have been referred to this category ought not rather to have been classed under a different head,—*Uterine Phlebitis.* To no one do we owe more, as regards the elucidation of this subject, and a painstaking investigation of the principal phenomena upon which it depends, than to Dr. Robert Lee. Opinions are, however, on this matter, far from harmonious; for, while Dr. Tyler Smith says that "one of the greatest, if not the greatest, advances ever made in the pathology of puerperal fever, consists in the knowledge we have obtained, in recent years, of the existence of Uterine Phlebitis as a very common and destructive form of puerperal disease," Dr. Murphy, on the other hand, observes that, "in place of being commonly met with, we believe uterine phlebitis to be a rare disease." It is easy to conceive, that when the tissues of the uterus are the seat of inflammatory action, it is no very simple matter to determine, during life, what share the various tissues of the organ take in the morbid phenomena upon which the symptoms depend. If the evidence is not altogether clear, many facts combine to show that there are, in a considerable number of cases of puerperal fever, indications of great significance, which it is difficult to explain on any other hypothesis. The earlier symptoms may, indeed, admit of a different interpretation. At first there is a rigor, followed by pyrexia, and accompanied with pain in the hypogastric region, which is very generally referred more particularly to the iliac or ischiadic region of one side. The condition of the lochial and mammary secretions varies, although the general tendency is to the arrestment of both. These symptoms are usually developed within three or four days after delivery, and diarrhœa—and not, as in the case of peritonitis, constipation—is a prominent feature in the case. A tympanitic condition of the abdomen is almost uniformly observed, but the general tenderness, and other symptoms of peritonitis, are, for the most part, absent. The pulse is, generally over 120, and sometimes reaches 150, and is soft and compressible from the first. Should resolution take place at this stage, it would, we believe, be impossible to say whether it has been a case of metritis, of phlebitis, of circumscribed peritonitis, or of any of these combined.

If the case goes on, however,—and, sometimes, in the worst form, very shortly after the seizure,—a new class of symptoms is developed, which alone can be held as pathognomonic of phlebitis, and of the toxæmia which is its result. The patient now complains of pain in various parts of the body,—most frequently in the neighborhood of the joints. In these situations, swellings and erysipelatous blushes appear, indicating the formation of secondary abscesses; or the abscesses may form internally, either in the neighborhood of the uterus, or in distant organs, such as the lungs, liver, or kidneys,—and occasionally they are imbedded deeply in the substance of the muscles. In some cases, the eye, and more commonly the left eye, has been the seat of violent destructive inflammation. Such formations of pus, if neither violent nor extensive, may, in some fortunate instances, be looked upon as critical, and in that sense favorable; but, unfortunately, experience points to a contrary result. In the worst cases, which have been observed in various epidemics, the tendency of the inflammatory process to attack the joints has been uniformly well marked, and the fearfully rapid nature of the action, the enormous quantity of pus which is formed, and the destruction of the articular cartilages, have only too frequently been demonstrated in post-mortem examinations. Dr. Tyler Smith, in directing attention to the fact that certain tissues are selected for this destructive action, observes, that "no explanation has hitherto been given of the reason why the joints, the eyes, or the serous membranes should be especially selected. I would suggest the probability, that this selection may depend on the nourishment of parts of the eye, cartilages, and serous membranes, by the non-vascular permeation of the tissues by the liquor sanguinis, as explained by the researches of Mr. Toynbee. The diseased liquor sanguinis, or in purulent infection of the blood, the liquor puris, may easily be supposed to affect especially those tissues of the body in which special provisions exist for their permeation, by the colorless parts of the blood. One of the earliest, as well as one of the most graphic, descriptions of puerperal affections of the joints, we owe to Dr. Coulson, who has described the careful dissection of numerous cases of this kind."

Puerperal phlebitis may extend to the proper tissue of the uterus, and also to the peritoneum, in which latter case the symptoms of peritoneal inflammation are superadded to those which more vaguely indicate inflammation of the uterine veins. It would appear that, in a certain number of fatal cases, the action is confined to the uterus—a result which may easily be explained by supposing that death had taken place before the toxæmia had time to produce its distal effects, in the production of abscess, &c. It must, however, in fairness, be conceded, that these are facts which admit of various interpretations. On this point, for example, Dr. Murphy remarks: "The morbid appearances of the veins in puerperal fever do not indicate inflammation. The uterine veins, especially in the broad ligaments, are very commonly filled with a purulent-looking fluid, but if this be wiped away, the coats of the vessel are pale, smooth, and of their natural thinness. This fluid is found spreading through a number of them; and often lies outside their coats. The uterus has sometimes been so completely infiltrated as to resemble a wet sponge more than anything else. But this is no proof of phlebitis."

Vaginitis.—A protracted labor, in which the presenting part of the child has been allowed to remain too long in the same position, may give rise, by pressure, to very severe inflammation, and even to sloughing of the walls of the vagina. In so far as the latter form is concerned, its results have already been incidentally referred to, and consist mainly of vesico-vaginal fistula, and of contraction of the vagina, or the formation of septa or bands, which ultimately constitute serious impediments to the progress of labor. There is, moreover, too much reason to believe that the injudicious or unskilful use of instruments is a fruitful cause of this complication, and, indeed, rash operative procedure of any kind is not unlikely to produce it, by the actual mechanical violence which is thus inflicted. Inflammation of these tissues, however, even when it does not proceed to gangrene, may prove a very serious complication, and, by the constitutional irritation which it engenders, may give rise to serious apprehension. The risk, in such a case, is not only from the effects of local lesion, but from the danger which exists of the fire which is thus kindled spreading, and, by involving the uterus, the peritoneum, &c., giving rise to the panic of a general conflagration. It may, with reason, be objected, that an inflammatory affection of this kind should not be included under the generic designation of puerperal fever; but, while we admit the force of the observation, we recognize between it and the other inflammations, as between those and puerperal fever, such intimate pathological affinities, that we have no hesitation in placing them in juxtaposition. Inflammation of the vagina is accompanied with much swelling and tumefaction of the neighboring parts, and with an alteration in the nature of the discharge, which gives rise to more or less of fetor. The orifice of the urethra is involved, so that there is extreme difficulty or impossibility of micturition; and the condition of the vulva is such as to give rise to great annoyance—these symptoms, taken together, affording a ready means of diagnosis.

A much more serious affection than this, and one which has, probably, a more direct connection with the influence of the puerperal poison, is inflammation of the vagina, of an asthenic type, similar to what occasionally occurs in the course of typhus or other fevers. In this case the whole vagina, without any obvious local cause, is quickly involved in inflammation of the type alluded to, which defies all treatment, local or general, and rapidly passes into gangrene. The result of such violent and rapid action has been to involve the recto-vaginal septum in almost its whole extent, and to cause such a degree of vesico-vaginal intercommunication as to defy even the improved remedial appliances of modern surgery. And even when the destructive process has not involved those viscera, we have seen such implication of the perineal tissues, and consequent contraction, as to leave a bare exit for the menstrual flux.

This is, of course, supposing that the patient survives. Unfortunately, however, when the inflammation assumes this type, recovery can scarcely be looked for, and the patient succumbs, either from the action of the morbid poison, from an extension inwards of the inflammation, or more frequently still, from these two causes combined. The extremely rapid and feeble pulse, with cold extremities, and the offensive lochial discharge, indicate the type of the case; and soon the clammy surface, the anxious countenance, with hiccup, subsultus, and delirium, show only too clearly that the end is at hand.

Another variety of puerperal inflammation is that form of the process which has its seat in the Uterine Lymphatics. This was first described in France by M. Dance, and has since that time attracted the attention, both in this country and abroad, of most systematic writers. The presence of pus within the vessels of the lymphatic system has been repeatedly demonstrated; but, in so far as the symptoms are concerned, it would seem to be impossible to distinguish the affection from some others which have been described, and especially from uterine phlebitis. But, besides this, it is extremely improbable that, in the condition of the uterus at the puerperal period, angeioleucitis should be present without involving, more or less, the other tissues. And, perhaps, the converse may equally hold good,—that inflammation originating in other tissues may very readily pass to the lymphatic system.

The various affections above detailed by no means embrace all the complications which may exist along with puerperal fever, whether in the relation to it of cause or of effect. And, if we were to attempt an analysis of what may be called anomalous cases, we would but complicate still further a subject which we are specially anxious to put in as simple a light as possible. Some have placed phlegmasia dolens in this category, and in the cases in which that affection has been observed along with puerperal fever, it may well be supposed that both are the result of the same poison. It is quite obvious, however, that puerperal fever cannot be considered as a result of phlegmasia dolens; otherwise, the latter affection would be looked upon with much apprehension, instead of involving, as it does, a favorable prognosis. The general state of the system in childbed, to which we have already so frequently referred, is singularly favorable to an extension of inflammatory action which has already been commenced. It need scarcely, therefore, cost us a moment of surprise, when we find the local inflammations of the puerperal state blazing out with a violence which defies extinction, and rapidly assuming the asthenic or adynamic features, which are held to be characteristic of the most fatal form of puerperal fever.

CHAPTER XLIV.

PUERPERAL FEVER—(CONTINUED).

MALIGNANT PUERPERAL FEVER—HISTORY OF EPIDEMICS—SYMPTOMS OF THE MALIGNANT VARIETY: VOMITING: DIARRHŒA: ABDOMINAL TUMEFACTION: EXPRESSION OF THE COUNTENANCE—COMPARISON OF THE SYMPTOMS OF THE INFLAMMATORY AND MALIGNANT VARIETIES—CONNECTION WITH OTHER ZYMOTIC DISEASES—MORBID ANATOMY: MALIGNANT AND OTHER VARIETIES CONTRASTED: PERITONITIS; METRITIS; PHLEBITIS: LESIONS OF OTHER ORGANS: STATE OF THE BLOOD IN MALIGNANT FEVER: PATHOLOGICAL APPEARANCES NO INDICATION OF THE VIRULENCE OF THE ATTACK—EVIDENCE OF A CHANGE OF TYPE IN PUERPERAL FEVERS—TREATMENT: ALL VARIETIES TO BE TREATED AS IF CONTAGIOUS: RECORDED RESULTS OF BLOODLETTING AND PURGING: GOOCH'S TREATMENT: TREATMENT TO BE REGULATED BY THE TYPE OF THE DISEASE: EFFECT OF EMETICS; CALOMEL AND OPIUM; TURPENTINE; BLISTERS AND EXTERNAL APPLICATIONS; TONIC AND STIMULANT TREATMENT—PROPHYLACTIC TREATMENT: USE OF DISINFECTANTS.

IN the view which we have taken of the subject, as explained in the preceding chapter, we have considered certain inflammatory affections of the puerperal state under the head of Puerperal Fever, not because we believe every case of local inflammation to be puerperal fever, but because of a strong conviction that the inflammation and the fever are so intimately connected with each other, that to disassociate them is, inevitably, to render the subject more complicated, as well as more obscure. In using the terms Peritonitis, Metritis, &c., we do not mean them to be accepted, as they have been by some, as synonymous with Puerperal Fever, although in their severer forms and more advanced stages, the malignancy of the symptoms, and the contagious nature of the disease, render it impossible to establish a distinction between them.

There is a class of cases, however, to which some have proposed to limit the designation "Puerperal Fever," which are characterized from the first by symptoms indicating the operation of a virulent poison. This form—generally described under the name of Malignant Puerperal Fever, or Puerperal Typhus—is extremely fatal, but is, fortunately, of comparatively rare occurrence, except when the disease is epidemic. Sporadic cases do, however, occur, in which the violence of the disease is scarcely less than in the epidemic variety; but the most appalling and dreadful features of puerperal fever have been, undoubtedly, observed in the case of epidemics, and especially when these attack the patients in large lying-in hospitals. The older writers describe this affection as "childbed fever." The term "puerperal fever" dates from the beginning of last century.

About 1746 a dreadful epidemic of puerperal fever appeared in Paris, a very accurate and full description of which was given by Malouin.[1] The mortality was so frightful, that at the Hôtel Dieu scarcely a single patient recovered. "The disease usually commenced with diarrhœa; the uterus became dry, hard, and painful: it was swollen, and the lochial discharge was irregular. The women then experienced pain in the bowels, particularly in the situation of the broad ligaments; the abdomen was tense; and to these symptoms was added headache, and sometimes cough. On the third or fourth day after delivery, the mammæ became flaccid. On opening the bodies, curdled milk (*sic*) was found on the surface of the intestines, and a milky, serous fluid in the peritoneum. A similar fluid was found in the thorax of certain women; and when the lungs were divided, they discharged a milky or putrid lymph."

During the latter half of the eighteenth century, violent epidemics appear to have occurred in most of the principal towns of Europe, and of these the history and details have, in many instances, been preserved. The lying-in hospitals of Vienna, Paris, Lyons, and London, were all in turn attacked, with results, as regards maternal mortality, too dreadful to contemplate. In the great hospital at Vienna, for example, the death-rate of all the women admitted, has reached as high as one in six. It would appear, further, that the disease, when once established in a locality, showed a tendency to return; and, with regard to Paris, Tenon observes, that "it has come to prevail more and more, and to be, as it were, naturalized." We must not suppose, however, that the mortality from this cause was only observable in the statistics of lying-in hospitals, for the disease spread by contagion as well as by epidemic influences, through all classes of society; and there can, we presume, be little doubt that the mortality was enormously increased by the obstinate incredulity of those who refused to admit that the disease was contagious. Still, it has always been upon lying-in hospitals that the great weight of mortality has fallen; and, although improvements in construction, and the greater attention which is now paid to ventilation, cleanliness, and disinfection, have greatly reduced the hospital death-rate, there is no doubt that much yet requires to be accomplished before perfection is attained, or even approached.

The statistics of the London, Dublin, Edinburgh, and Aberdeen hospitals all show that, wherever observed, the disease was a very fatal one; but if we examine into the details given of previous epidemics, we cannot fail to be struck with the fact that there has been a great variety in their nature. When we find a history of an epidemic in which the mortality has been comparatively trifling, and bloodletting has obviously been attended with a beneficial result, we may well doubt whether this should be called puerperal fever. It certainly does not rank under the malignant class. But, putting aside for the moment such doubtful epidemics, we find that when the asthenic type of the disease is perfectly marked from the outset, the local lesions vary at different times; and we thus observe that in some epidemics the peritoneum is chiefly involved, while in others the affection of the joints, and other distant parts, may be held to indicate the presence of uterine phlebitis as the special characteristic of the prevailing epidemic. Another fact, which stands out very prominently in the history of epidemics, is the marked variation in the intensity of the disease, or the virulence of the poison, so that in one case we have a low percentage of deaths, while in another the patients are, as it were, struck dead by a fever which runs its course in a few hours.

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[1] Mémoires de l'Académie des Sciences, 1746.

It is a fact, beyond all question, that the disease we are now considering attains its maximum of intensity in hospital epidemics. It usually originates in the course of the second, third, or fourth day, although sometimes later, and cases have been recorded in which it has come on before delivery. It is sometimes ushered in by a rigor, but this is far from being invariable; and, indeed, it may be remarked, that the violence of the rigor is in this case much less marked than in some cases where the impending disorder is comparatively trivial. The patient is conscious, from the first, of a feeling of great depression, which is often accompanied with headache and uneasiness at the præcordial region. There has often been observed, even thus early, a haggard, anxious expression of countenance, as if she were in dread of an impending calamity. The pulse is feeble, or at least compressible, and is seldom less than 130. The skin is, as a rule, hot and dry. It is not so, however, in all cases, as it sometimes happens that the patient is found from the first to be bathed in a profuse perspiration. There may thus be a rigor and a hot stage, quickly followed by free perspiration, which, supposing it to be critical, we may look upon as a favorable augury. As the case goes on, we soon observe that the discharge from the skin brings no relief to the symptoms, but continues profuse to the end, and a peculiar odor has sometimes been observed. Those instances in which the perspiration constitutes a peculiar feature of the case are not common, but were considered of sufficient importance by Blundell to warrant him in describing a distinct variety of puerperal fever, which he, from the leading symptom, called "Hidrosis," or "Hidrotid Fever."

Generally speaking, however, the skin is hot and dry, although towards the termination of a fatal case it becomes cold, damp, and clammy. The effect produced on the milk and lochia is variable; and there are even cases in which these discharges are more than usually abundant. Vomiting is by no means an uncommon symptom; but it does not generally come on very early, and the matter ejected is sometimes dark in color, like coffee-grounds, and occasionally very offensive. Diarrhœa is, as we have already seen, an almost invariable symptom in the later stages of those inflammatory affections which pass into puerperal fever; but, in cases of the malignant type, diarrhœa comes on at a much earlier stage, when the offensive nature of the evacuations often indicates still further the extent to which the digestive functions are involved. The tongue presents at first no distinctive character, but, as the case rapidly advances, the deep fur—white or brownish, moist or dry—is a further index of the extent to which the normal functions are disturbed. In a very large proportion of cases, the peritoneum, or uterus, or both, are involved. Thus, one of the earliest symptoms, after the disease has been thoroughly established, is abdominal pain, which either originates in the hypogastric region, or, more exceptionally, in the epigastrium. The pain is excessively acute, so that the patient will frequently complain of the weight of the bedclothes; and it is soon accompanied with more or less swelling, or tumefaction,—the enlargement being due, in the first instance, to flatulent distension, and, subsequently, to fluid effusion, which is poured into the cavity of the abdomen. In some cases, the pain is associated with enlargement of the uterus, which may be recognized through the abdominal walls. This has sometimes given rise to the idea, when the general symptoms were not carefully observed, that the pain was due to those irregular contractions of the organ which are commonly known as after-pains, and, under this impression, valuable time has been lost.

As the abdominal distension increases, which often happens with extreme rapidity, the sufferings of the patient are proportionally augmented. She now lies on her back, breathing shortly, with her knees drawn up, and exhibiting on her countenance that appearance of ghastly distress which is so painful to witness. The surface and extremities now become cold; the mechanical impediments to perfect respiration cause something of lividity of the countenance; and the symptoms, becoming otherwise more grave, indicate that the period has been reached when hope may be wellnigh abandoned. At this period, the abdominal pain, tenderness, and tension often diminish; and, but for the ominous pulse and countenance, we might fancy that the patient was better. The diarrhœa continues, the stools being passed in bed; vomiting occurs, without any retching, of a dark or greenish matter; and the patient may now breathe with greater ease. The pulse is undiminished in frequency, but it is otherwise changed for the worse, as is indicated by its thready or imperceptible character. The intellect generally remains clear to the end; but in some cases low muttering delirium, subsultus tendinum, and other similar symptoms, come on before death ensues.

Such symptoms are, as will be observed, almost identical with those which have been described as characteristic of the fatal inflammatory affections previously described. If we attempt to follow the description and classification of various authors, we find that the varieties and divisions of puerperal fever are infinite, and are, were we disposed still further to classify, susceptible of more elaborate subdivision still. For our present purpose, however, it may suffice to observe, that although we believe the symptoms above detailed to be essentially those of true puerperal fever in its ordinary form, other varieties may exhibit themselves, in the experience of any man, which may differ in important particulars. But we recognize in this admission no reason for more elaborate classification of a subject which has already been classified out of all shape, and which, plastic as it is, it is difficult to mould into a simple, comprehensive and comprehensible form.

We may here advert, however, in a single word, to those cases in which the symptoms of some other specific disease precede or accompany puerperal fever. The most important of these are scarlet fever and small-pox; and when a patient in the puerperal state is unfortunate enough to become the subject of one of these disorders, the usual course observed is, that the characteristic symptoms—eruptive and otherwise —of either disease assume a more malignant type, and are generally merged in signs of more serious and fatal import, which spring from the puerperal state.

Morbid Anatomy.—The various forms under which puerperal fever may manifest itself involves, almost necessarily, a corresponding variety in the appearances produced in the different tissues which may be implicated. In the case of the post-partum inflammatory affections which, after a somewhat longer course, apparently pass into puerperal fever, and thence to a fatal result, the appearances of an ordinary local inflammation are, as we might confidently anticipate, more distinctly revealed. In peritonitis, for example, the more closely the case resembles, in its symptoms and progress, the purely local disease, the more closely do the morbid appearances correspond. Dr. Murphy, who differs from us in separating, absolutely, peritonitis from puerperal fever, says, in regard to this, "In peritonitis, all the arterial capillaries are highly injected, hence the intestines are streaked with bright red lines of capillaries that encircle them; in puerperal fever, the venous capillaries predominate, hence the livid hue of the intestines, and the dusky red color of the patches and streaks on their surface. In peritonitis, the lymph which is poured out is adhesive, uniting the different parts like glue; if removed from the surface of the intestines, on which it is deposited, the strings of this lymph are broken across, and the surface is rough; the quantity of serum poured out is not great, and, being lodged in the cavity of the pelvis, may at first escape observation. In puerperal fever, that which we call lymph is not adhesive; it is much more abundant than adhesive lymph,—covering the fundus of the uterus, the intestines, the liver, the diaphragm; it is found also in the pleura; its color varies from a dusky brown to a pale yellow; it may be peeled off the liver, the intestines, or the uterus, quite easily; the surface from which it is taken is smooth, and that of the intestines is of a dark-red color. The quantity of the serum is equally profuse; and this substance being dissolved in it, gives it a lactescent appearance like pus; hence it is called sero-purulent fluid. Thus, when the abdomen is opened, a large quantity of the fluid always escapes. It will be objected that this sero-purulent fluid is also met with in peritonitis. This is perfectly true; but it is necessary to note the stage of the inflammation in which it is observed. We have never met with it unless in the second stage of the attack. When a patient died in the first stage, there was none of it. We conclude, therefore, that in the former instance (the second stage) such effusions only occurred when the constitution was sinking under the attack; but in the latter, when death took place from a different cause, the effusions noticed were the true products of inflammation. In puerperal fever, the greater the intensity of the seizure, the less the chance of meeting anything like lymph. In the most intense forms, no effusion at all may take place. In a degree less intense, a large quantity of serum, colored brown by blood, is found in the peritoneum, and throughout the tissues. The lymph poured out is of the same color, having no adhesion to the surface on which it lies, as if the fibrin of disorganized blood had been deposited there. In the next degree, the same kind of lymph, or fibrin, is found, of a yellow color, with a quantity of sero-purulent fluid. And, lastly, in those cases in which the constitution for a time struggles successfully against the fever, some adhesive lymph will be met with, mixed up with a large quantity of what we have just described. You will perceive that, in protracted cases of either disease, the morbid appearances most nearly resemble each other; but that, in cases which are quickly fatal, the distinction between them is quite sufficient to enable us to separate one from the other."

Admitting the perfect accuracy of Dr. Murphy's description, as above quoted, we recognize in it no reason for modifying the opinion which has been expressed, that the fever may either, as is usual when it is directly propagated by epidemic influences—in which case the virulence, or concentration of the poison, reaches its point of greatest intensity—be primary; or it may appear subsequent to the occurrence of true peritoneal inflammation, when it may be termed secondary. Moreover, peritonitis may run a favorable course, or may even, possibly, prove fatal without having passed into puerperal fever. All those assumptions are in perfect harmony with the facts which morbid anatomy has revealed, although it may be too much to assert that they find in the latter conclusive and satisfactory proof.

The relation which inflammation of the womb bears to puerperal fever is illustrated by morbid anatomy, in a manner precisely analogous to what we have observed in the case of peritonitis. In a case of simple metritis, the chief appearances are, enlargement of the womb, with a soft and flabby condition of its substance, and increased vascularity. As a rule, the inflammatory process spreads to the peritoneum, as is evidenced by the condition of that portion of it which immediately surrounds the uterus, which is highly vascular, coated with lymph, or possibly softened. The muscular tissue of the womb has been observed, in a very considerable number of fatal cases, to be softened entirely or partially; and it has also been noticed that the most frequent seat of this and other uterine lesions is the site beneath which the placenta was attached, and next to that, the large and flabby cervix. The formation of pus is also by no means unusual; on which point Boivin and Dugès observe that "pus is sometimes found even in the substance of the womb, and generally nearer to its exterior than its interior surface. Thus pus collects into distinct abscesses, from one to five inches in diameter—sometimes into a simple or multilocular deposit, with a greenish or viscous appearance; at other times it is infiltrated into the fleshy fibres, imparting to them a reddish-yellow color, perceptible through the peritoneum. In this latter case tumors form—which are sometimes hard and projecting—upon the fundus uteri; at other times they are flattened, soft, and broad. These latter come further down towards the lateral regions, and often form a continuation, together with purulent infiltration between the laminæ of the broad ligaments, with the cellular tissue of the pelvis and the substance of the ovarian ligaments." This has reference to certain secondary purulent formations which we shall have occasion to notice in our next chapter. In the more malignant and fatal cases of metritis associated with puerperal fever, the tissues of the womb have been observed, after death, to be gangrenous. There is here, also, as in the peritoneal form when rapidly fatal, a tendency to turbid effusion into the serous cavities.

The most interesting, however, of all the points upon which pathological anatomy may be expected to throw light, are those which are connected with uterine phlebitis—an affection which has, as we have seen, been supposed by eminent modern writers on the subject to bear the most intimate relation to true puerperal fever. It is possible that this idea has been somewhat exaggerated; but we are amply justified, from every point of view, in carefully considering the morbid phenomena which, in these cases, post-mortem examinations have disclosed. The primary and essential morbid change in this variety is inferred from the condition in which the ovarian and uterine veins, and their branches within the uterus, have been found. We do not doubt that here, as in phlegmasia dolens, erroneous inferences have been drawn from a mere discoloration of the lining membrane of the vein, associated with the presence of a clot; but many of the appearances which have frequently been observed and described are so unequivocal that the existence of true phlebitis must be conceded. Of this nature are thickening, contraction, and absorption of the tissues of the vein, and the presence of lymph and pus as obvious products of local inflammatory action. The necessary result of such an affection as this is coagulation of the blood contained in the affected vessels, obstruction to the circulation, in proportion to the extent of the disease, and the formation of pus. Certainly in some cases, and probably in many, this inflammation of the veins is associated with softening of the muscular tissue, or some other sign equally significant of metritis.

In the less severe cases it will probably be found that the inflammatory process has not extended further than the veins of the uterus itself, or the veins which directly communicate with it; but in some instances evidence of inflammation is said to have been traced as high as the renal veins, or even the vena cava itself, although there is reason to believe that, in these latter examples, the mere presence of pus in the vein has sometimes been admitted as evidence of inflammation of its structure.

The presence of pus within the veins, in the region of the uterus, is to be accounted for chiefly by the changes which take place in the blood-clot, which is the more immediate result of phlebitis. Coagulation is, as we have seen, equally the result of septic action; but we are here considering it as the result of, or, at all events, as associated with, true inflammation of the veins. From the disintegration and decomposition of the blood-clot, pus is evolved, and becomes the cause of the most characteristic of all the morbid appearances of uterine phlebitis. These are the secondary and distant inflammations, or abscesses, which have already been mentioned. The circulating medium is poisoned with pus, the result of which may be immediate septic coagulation; or, the poison being carried by the blood to distant localities, it there produces the secondary phenomena which may be disclosed after death.

In a large proportion of these cases, swellings are observed in the neighborhood of the joints, which, on being freely incised, give exit to pus. In the worst cases pus is found within the joint itself, and the ligaments and cartilaginous surfaces afford proof of a rapidly destructive inflammation. If the eye has been affected, evidence will there be found of inflammation, of equal violence, although limited in extent. Abscess may also be found in the muscles or cellular tissue of the limbs; and, in other cases, what has been supposed to be an abscess has turned out, on examination, to be an effusion of sero-sanguineous fluid. The brain is rarely affected, but within the cavity of the chest clear evidence has often been observed of that metastasis of inflammation to which allusion has already been made, sometimes within the lungs, which have been found condensed, of a dull red color, and infiltrated with purulent matter; while at other times the violence of the disease seems to have expended itself mainly on the pleura. The heart is often enlarged and softened, and within the pericardium, lymph and serum may, with the usual alterations in the membrane itself, afford conclusive proof that inflammation has been present here also. The various portions of the intestinal canal, from the stomach to the rectum, have, in exceptional instances, been found to have been severely affected, usually by a simple extension of the inflammatory process from the contiguous position of the peritoneum. Ulceration and perforation of the stomach have been noted in some of those cases. The spleen and liver have also been found to be extensively disorganized, and their tissues the seat of single or multiple abscesses. In the greater number of the cases which were examined by Dr. Hulme, he found the omentum inflamed, and frequently black and gangrenous. In no small proportion of fatal cases, the kidneys have been found to present evidence of similar disorganization, obviously the result of violent inflammation: generally speaking, one kidney only is affected.

In the malignant variety of the fever, the following indications, in addition to those which have been already detailed, are mentioned by Dr. Copeland, in his "Dictionary of Practical Medicine." In several cases, in which bloodletting had been practiced, he observed, that "on every occasion I was struck by the peculiar faint odor, and very dark hue of the blood; by the very soft state of the clot when the blood did separate into crassamentum and serum; by the appearance which occasionally presented itself, of a mass exactly resembling, in color and consistence, a common jelly, the coloring matter covering the bottom of the vessel in the form of a precipitate; and by, in some instances, a separation only of serum, the large, loose, gelatinous crassamentum, consisting chiefly of this jelly-like matter, the lowest stratum of which contained the black or dark-brown precipitate of coloring matter. These appearances of the blood were presented in several cases in the hospital, in 1823 and three or four subsequent years, in which cases blood had been taken before I saw the patients. It may here be remarked, that I have seen many cases of this form of the disease, in which leeches had been applied to the abdomen; but in nearly all, and especially in those which occurred in the hospital, the blood which flowed from the bites did not coagulate; and great difficulty, almost amounting to an impossibility, of arresting the bleeding from them was generally observed, owing both to the state of this fluid, and to the impaired vital cohesion of the tissues, characterizing the advanced stage of the malignant form of this domestic pestilence." This condition of the blood, which has frequently been remarked, points very significantly to the operation of some powerful morbid poison. In the cases which prove most rapidly fatal, nothing may, indeed, be revealed on examination, beyond this peculiar condition of the blood, and, it may be, a little turbid serum in the peritoneum and the other serous cavities.

The pathological appearances, then, are no reliable indication of the virulence of the attack, as has also been frequently observed in the case of other febrile diseases which prove rapidly fatal. Generally speaking, however, in very severe cases, the extent of the local lesions is commensurate with the severity of the attack; and, although we may meet with cases in which, after a fatal result, the metro-peritoneal symptoms are moderate in degree, a careful examination will usually disclose irrefragable evidence of violent local inflammation. While, therefore, the appearances are often such as to indicate a degree of malignancy and rapid action, which can only be explained on the hypothesis of puerperal fever, we are aware of no mode of disclosure by which morbid anatomy can reveal to us, with even an approach to certainty, how we may distinguish between the various types of the disease. The post-mortem appearances in the sporadic variety are certainly much less formidable than in the epidemic form; and, indeed, it is evident that the description, both of symptoms and of morbid appearances, which we read in many admirable works, is founded almost entirely upon an experience of hospital epidemics; whereas, it should be clearly understood that the disease in sporadic cases, or even when communicated by contagion in private practice, is, as a rule, much less disastrous in its results than the once dreadful, and still formidable scourge of lying-in hospitals.

Another point which we have already alluded to in reference to the symptoms, is also borne out by a careful analysis of recorded morbid phenomena. This is the tendency in the disease to change its type or form, as evidenced by the tissues which, in successive epidemics, or even at short intervals during the same epidemic visitation, are mainly affected. It were easy to multiply illustrations of this, but we shall, in the meantime, content ourselves with the following example from the experience of M. Tonnellé, whose name has already been mentioned in connection with the subject: "Softening of the uterus," he states, "after showing itself frequently in the first half of the year 1822, and particularly about January, disappeared entirely in the months of July and August, which were characterized, in a remarkable manner, by the frequency of inflammation of the veins. Afterwards, it began to rage anew with great violence in September and October, and again disappeared in the last two months, during which term the mortality was inconsiderable."

Treatment.—The treatment of the various affections which we have been considering under the common designation of "puerperal fever," necessarily varies, according to the class to which each case belongs. If, however, we take what is at once the most simple and comprehensive view of this part of our subject, we shall find that the symptoms and morbid appearances equally disclose the fact that there are two classes of cases, presenting, respectively, the sthenic or the asthenic types, and requiring, therefore, not only different, but directly opposite methods of treatment. Nothing can well be imagined more absurd, and nothing, in fact, has been more disastrous in its results, than to manage all cases of puerperal fever—whatever meaning we may attach to the term—upon one and the same principle. One feature, indeed, is common to all cases, and consists in the contagious nature of the disease. This is the leading idea, which, more than anything else, we would impress upon the student with all the emphasis at our command. Whether the case be one of peritonitis, metritis, or malignant puerperal fever, the risk of contagion must always be borne in mind; and, although we must admit that the danger is much less in, for example, simple peritonitis, we can never be sure that it is absent, and therefore we should treat every case, without exception, as if its contagious nature were already demonstrated.

A further reference to the history of various epidemics shows, with remarkable clearness, that methods of treatment which have been found useful at one time have proved the reverse of beneficial at another. Dr. Gordon, who, in 1789, when the disease appeared in Aberdeen, saw a large number of cases, wrote, several years afterwards, a most excellent treatise on the subject, in which he drew attention, with much force of argument and illustration, to a new and successful method of practice, by means of the bold and early use of the lancet,—taking twenty or twenty-four ounces at once, and, if necessary, ten more soon afterwards. "When I took away," he says, "only ten or twelve ounces of blood from my patient, *she always died;* but when I had the courage to take away twenty or twenty-four ounces at one bleeding, in the beginning of the disease (*i. e.*, within six or eight hours after the attack) *the patient never failed to recover*. After the bleeding, it was my practice to bring on a diarrhœa, which, when excited, I found necessary to continue through the whole course of the disease, till it was entirely conquered." Nothing, we would say, were we reading of a new and unknown disease, can be more simple than this; nothing more clear than the indications of practice. In an epidemic which occurred in Leeds early in the present century, the treatment of Dr. Gordon was energetically adopted by Mr. Hey; and although, prior to this, every case that had come within his knowledge died, no sooner did he purge his patients, and bleed them early, to the extent of thirty, forty, and even fifty ounces, than they recovered, in the proportion of thirty cases out of thirty-three. Such facts, which were further corroborated by Armstrong, Mackintosh, and others, were held to be so significant, that for many years the treatment of epidemic and contagious puerperal diseases was, simply, heroic bloodletting.

About 1829, a remarkable essay was published by Gooch on what he terms "The Peritoneal Fevers of Lying-in Women," which effectually staggered the belief of those who had clung most persistently to the bold measure of Gordon. It would seem that, before this, doubt, founded upon unsuccessful results in treatment, had sprung up in the minds of many; but, till Gooch wrote, no one had had the courage to controvert ideas so generally entertained. One of the first points to which he calls his readers' attention, and which he states with great force, is the marked distinction which subsists between various epidemics, and the result of their treatment at the hands of different observers, who imagined that they were all treating the same disease. He makes it quite obvious that the diseases of which William Hunter wrote, "of those attacked by this disease, treat them in what manner you will, at least three out of four will die," cannot be, in all respects, the same as Dr. Butter treated in Derbyshire, "with ten grains of rhubarb and ten grains of cordial confection every day," without a single fatal result. Nor can it be possible that the fatal scourge of the London and Paris hospitals can be the same as that observed by Richter of Gottingen, of which he observes, "I have often seen the childbed fever, and always treated it successfully." Gooch began his practice with a decided prejudice in favor of bloodletting, and his results seem to have been so far satisfactory, when he saw the patients early; but when several days had been allowed to elapse, the issue was almost uniformly fatal. As his experience increased, he fully recognized the fact, that a blind and slavish adherence to the lancet sometimes inflicted irreparable injury upon the patient.

In 1823, Dr. Copeland was appointed consulting physician to Queen Charlotte's Hospital, and the result of his experience is given by Dr. Fergusson. "The disease was malignant, and often ran its fatal course in twenty-four hours from the first appearance of the symptoms. . . The treatment ultimately adopted by Dr. Copeland for this malady was boldly stimulant. Immediately upon the appearance of the symptoms, a bolus containing from eight to sixteen grains of camphor, from ten to twenty grains of calomel, and from one to three of opium was given, and repeated in four, five, or six hours. The dose of camphor was very rarely less, and but seldom above that named, and the interval between the two doses sometimes only three hours, but never longer than six hours. The dose of opium in the second and subsequent boluses was regulated according to the effect of the first. Soon after the second bolus was administered, about half an ounce of spirits of turpentine and an equal quantity of castor oil was given, on the surface of some aromatic water; and if these did not operate fully on the bowels within three hours, the same medicines in double and treble quantity were administered in enemata. The bolus just mentioned was still continued at the same intervals, or after five or six hours from the exhibition of the second or preceding one. Very soon afterwards, and generally subsequent to the administration of the turpentine draught and enema, a large piece of flannel folded several times, and sufficient thus to cover the whole abdomen, was directed to be wrung as dry as possible out of very hot water, to be instantly freely sprinkled with spirits of turpentine, and applied over the abdomen, to be closely covered by wash-leather or a dry cloth, and to be kept thus applied for some time, or renewed until erubescence of the surface of the abdomen was produced. The success of the above treatment in the malignant form I found to be almost complete, for *scarcely a case terminated fatally* in which it was early resorted to."

It is quite clear that the stimulating treatment detailed in the above extract, and which was attended with results so satisfactory, must have been directed against a fever of a different type from that which was encountered by Gordon and Hey. The more, indeed, do we study the history of puerperal fever, the more prominently does the fact stand out that the type of the disease has varied much during the last hundred years; and that while, in one epidemic, the sthenic or inflammatory nature of the symptoms have been such as to warrant the boldest antiphlogistic treatment, in another, the asthenic type has prevailed from the first, when stimulant treatment only has been attended with success. We shall not here enter upon the question, whether or not there has been, as some have alleged, a general change in the type of all diseases from the sthenic to the asthenic form; but, admitting the force of many facts which have been advanced in support of this assertion, we confess to having entertained all along a strong impression that the idea has led to an all but invariable discontinuance of general bloodletting as a feature of modern practice, which is an exaggeration, and, as such, to some extent, an error. It is quite clear, however, that during the last forty years the type of puerperal fever has been usually, although not invariably, asthenic or adynamic.

All this leads directly to the practical conclusion that the nature of the treatment to be adopted must depend upon the type under which the disorder presents itself, and also upon the stage at which the case is brought under the notice of the physician. There is no single plan of treatment applicable alike to all cases. Indiscriminate bloodletting is as sure to lead to disaster as invariable stimulation; and it is the first duty, therefore, of the judicious practitioner to determine the nature of the individual case, and the special treatment proper to it. The cases to which bloodletting is most applicable are undoubtedly those in which the earliest symptoms indicate acute inflammation of the peritoneum, of the uterus, or, more probably still, of both. When a patient, therefore, of robust constitution, who has been exposed to contagion, complains, after a rigor, of acute hypogastric pain, which is accompanied by a rapid, incompressible pulse, throbbing temples, and suffused countenance, we should not hesitate to bleed at once, and freely, from the arm, even to the extent of twenty or twenty-four ounces as recommended by Dr. Gordon. If the thing is to be done at all, it must be done boldly; and, above all, it must be done early, for, if the patient has passed the acute stage, to bleed her is probably to hasten her doom. We have said that this treatment may be adopted in the case of a woman who has been exposed to contagion, but it is not to be assumed that bloodletting is necessarily confined to such cases. The words are inserted rather as a precaution, lest inexperience should rashly adopt an heroic treatment in such cases as acute tympanites, or even in severe after-pains, when the pulse often rises. Clear evidence of acute inflammatory action is the safest and indeed the only test. It is to be remembered, however, that cases do occur in which the symptoms are such as to baffle even the most experienced observer; and in such instances it has been suggested that the bleeding should be more tentative in its nature, the effect of the flow being carefully noted, and only continued if the pulse and other indications show that it is being well borne.

It does not, in the least, matter what names we give to those acute affections upon which bloodletting has been found to produce so decidedly beneficial an effect. For all practical purposes, it is sufficient carefully to distinguish between them and the asthenic cases, in which the lancet is absolutely forbidden. Whether the latter have been asthenic from the first, or have passed into that state, after a period of dynamic or acute inflammatory action, the effect of bloodletting will be equally disastrous in its results. A rapid, compressible pulse, distended abdomen, diarrhœa, and the characteristic appearance in the countenance of ghastly distress, are among the more important of the signs which indicate that depletion must not be ventured upon.

The same simple rule must be our guide as to the administration of purgatives. Free purgation is generally proper, in the cases to which venesection is applicable; and it is well known that, in peritonitis, constipation is an almost invariable symptom. The extent to which purgation is to be carried, and the class of medicine to be selected, must be determined, in each case, according to the judgment of the medical attendant; but it may be well for him to remember that, in some fatal cases, the morbid appearances have been such as to suggest the probability of an irritant action from violent drastics having had some share in the result. It is better, therefore, when the bowels do not respond to a sufficient dose, rather to supplement that by an enema, than to run the risk of further irritation. In the later stages of the ordinary disease, or in the malignant variety, strong purgatives are contraindicated, not only because diarrhœa is a common symptom towards the end, but because there is no hope of a beneficial derivative action from the bowels. To such a case, the milder laxatives, or enemata containing turpentine, are appropriate.

In the worst forms of the disease, and especially in hospital epidemics, the power of medicine and the skill of the practitioner are alike set at defiance; but, however desperate the symptoms, and apparently hopeless the prognosis, we must persevere so long as life lasts. Between simple puerperal peritonitis and the malignant fever—which is as deadly as the plague—infinite varieties may be observed; but the management of all will be more successful if we proceed upon general principles, rather than minute and special distinctions. We shall, therefore, content ourselves by mentioning, in addition to the means already detailed, the various remedies which have been found useful by the most experienced and able of those who have written on the subject.

M. Doulcet, in the course of a severe epidemic at the Hôtel Dieu, thought of using emetics at an early stage of the disease, and the results, as detailed by him, were eminently satisfactory. Subsequent experience, however, has not realized, in the hands of others, the hopes which M. Doulcet's statements seemed to encourage. The emetic employed was ipecacuanha, and it was repeated daily until the symptoms were subdued,—a potion being administered in the interval, composed of oil of almonds, syrup of marsh mallow, and Kermes's mineral. At one time, calomel was given very freely in those cases, and, on the whole, as it would appear, with benefit. On this point Gooch observes, "I have never given it systematically in a number of cases, but what experience I have is in its favor. In the Westminster Lying-in Hospital, where ten or twenty grains of calomel used to be given every day, with purgatives, the gums sometimes were affected, and these patients invariably recovered." The fact of all those recovering where the gums were affected may, however, be otherwise explained, on the supposition that if they live long enough for mercury to produce its constitutional effect, the urgent danger of the case has necessarily, in some measure, passed. It will generally be found advantageous to combine opium with the mercury, but, in this respect, much will depend upon the stage which the disease has reached. Spirits of turpentine was at one time highly recommended in the treatment of puerperal fever, but the effects produced by its internal administration seem to have been somewhat exaggerated. Flatulent distension of the bowels is, however, so frequent a complication that we would naturally anticipate some benefit from this drug, although, perhaps, it would be more correctly described as a palliative.

Blisters to the abdomen have been thoroughly tried, but without any very satisfactory result. Among modern authorities, Dr. Churchill seems, however, to retain some belief in their efficacy, and says that, from the cases he has seen, he is "inclined to think blistering useful, and it affords an opportunity of applying mercurial ointment to a highly absorbent surface." Iodine has also been suggested, but the external applications which find most favor are either warm poultices or turpentine fomentations.

The asthenic character which has been so generally observed in the more recent epidemics has led many, whose experience has been confined to cases of this type, to discard all treatment in favor of a stimulant and tonic regimen from the first. Dr. John Clarke gave bark in powder and decoction, with opium and wine. M. Beau found great benefit in the use of quinine in doses of fifteen to thirty grains in the day. These facts, however, afford only further illustrations of what we have repeatedly urged, as the foundation of all rational treatment, that it must be adapted to the type of the disease.

The question of prophylactic treatment, which naturally suggests itself here, is second in importance to no point relative to our subject. The rules of lying-in institutions are generally framed with the view of prohibiting students who are engaged in the dissecting-room from the practice of midwifery, or, at least, point to the strictest precautions being observed. The danger, however, is much greater for those who are engaged as dressers in hospitals where there is erysipelas or hospital gangrene. Improved ventilation has proved in hospitals an invaluable check on the ravages of the epidemic disease; and there is good reason to believe that in some instances neglect of proper drainage has led to an aggravation of the type. The case of the General Lying-in Hospital, which was built on the marshy land by the Thames, affords an illustration of this, as after proper drainage the mortality in that institution diminished in the most remarkable manner. Where there is the slightest reason to suspect the possibility of any zymotic influence, chlorine, Condy's fluid, or carbolic acid should be freely employed, as there cannot be the slightest doubt that these agents tend to neutralize this or any other morbid poison. Large lying-in hospitals, as at present constructed, must be unhesitatingly condemned; for great as are the educational advantages attached to such institutions, the cost in human life is too fearful to contemplate. The smaller establishments are more easily managed, and of late years show a rate of mortality which is, as compared with former experience, highly satisfactory. Still, much in this particular direction requires to be done before hospitals are freed from this one special danger, and it is more than probable, as we conceive, that this may ultimately be achieved by the cottage-hospital plan, the great objection to which as yet, in large towns, has been its cost. When a practitioner has attended a case of what has appeared to him to be puerperal fever, it by no means follows that he will transmit the disease, but he should always act with the fear of such a result before his eyes; and, should successive cases occurring in his practice indicate that he was the conductor of the poison, it is a duty that he owes to humanity to withdraw for six weeks or more absolutely from the practice of midwifery.

CHAPTER XLV.

PELVI-PERITONITIS, ETC.: ANÆSTHESIA.

PELVI-PERITONITIS, AND OTHER ALLIED AFFECTIONS—INFLAMMATION OF THE UTERINE APPENDAGES—"FULNESS," "HARDNESS," AND "TUMOR"—PELVIC CELLULITIS: ANATOMY OF THE PELVIC CELLULAR TISSUE—BERNUTZ ON PELVI-PERITONITIS—DIAGNOSIS OF PELVIC CELLULITIS AND PELVI-PERITONITIS—ENGORGEMENT OF THE UTERUS—DETECTION OF PUS: FLUCTUATION—TREATMENT: ALLEVIATION OF PAIN: APPLICATION OF LEECHES, POULTICES, FOMENTATIONS, ETC.: METHODS OF PROMOTING ABSORPTION; MERCURY; IODINE; COUNTER-IRRITATION: THE OPERATIVE TREATMENT OF ABSCESS—PERI-UTERINE HÆMATOCELE—ANÆSTHESIA: VARIOUS ANÆSTHETIC AGENTS: EFFECTS OF CHLOROFORM ON THE BLOOD, AND ON THE PROGRESS OF LABOR: DISADVANTAGES OF CHLOROFORM: MODERN PRACTICE.

In addition to the diseases which have been grouped together in the two preceding chapters, under the common designation of puerperal fever, there are other affections, chronic for the most part in their nature, which require some notice at our hands. These are by no means necessarily associated with the puerperal state, although about half of all cases have their origin in inflammatory processes which arise, more or less distinctly, from the condition under which women remain for a certain period after delivery. The connection between the disorders which we are about to describe and puerperal fever is, in some cases, direct and unmistakable; but, in the great majority of instances, the disease, although inflammatory in its nature, has no such intimate relation to puerperal fever as to admit of its being placed in the same category. For these and other reasons, it is thought better to consider the group of affections to which we have referred as separate from, although associated with, those previously described.

In most systematic works, even by those whose merit is universally recognized, these affections are dismissed with a brief notice, and under a great variety of names. The first difficulty, therefore, which we encounter is in the matter of nomenclature—*Pelvi-peritonitis*, *pelvic cellulitis*, *subperitoneal inflammation*, *peri-uterine phlegmon*, *perimetritis*, *parametritis*, and *inflammation of the uterine appendages*, are only a few of the many designations under which this group of affections have been described; which may be most usefully considered together, for purposes of analysis and such description as is here possible. A very brief preliminary definition of the various terms above employed is, however, essential.

What was originally described by M. Nonat as *peri-uterine phlegmon*, is better known to English readers under the more familiar designation of *pelvic cellulitis*, with which we may assume it to be almost synonymous. The idea involved is an inflammatory affection, tending to the formation of abscess, which has its seat in the cellular tissue between the uterus and peritoneum, or in some other part of the same tissue within the pelvis. Both expressions are unfortunate, and involve a fundamental error. *Subperitoneal inflammation* is another synonym equally objectionable. That *inflammation of the uterine appendages* is very commonly associated with the class of affections which we shall describe is universally admitted, but if used as a comprehensive designation, as Churchill has employed it, it may be supposed—and if so very erroneously—to be confined to these tissues.

Dr. Matthews Duncan, who has treated the subject in his well-known work at considerable length, and with his usual ability, adopts the words *parametritis* and *perimetritis*, borrowing the idea of this nomenclature, as he tells us, from Virchow, who, taking example from the heart and other organs, purposes to use *peri* to signify inflammation of serous membrane, and *para* to imply inflammation of cellular or connective tissue. "Perimetritis, then," he adds, "will strictly imply inflammation of the uterine peritoneum. Parametritis will imply inflammation of the cellular tissue in connection with the uterus. Similar terms may be found for the Fallopian tubes, *perisalpingitis* and *parasalpingitis*, and likewise for the ovaries. But I shall seldom have occasion to resort to them. In the present imperfect state of our diagnostic resources, it would be mere pedantry to do so frequently. There are only a few cases in which we can assert, during life, at least, that the pelvic peritonitis is perisalpingitis, or perioophoritis, or that the pelvic cellulitis is parametritis, parasalpingitis, or paraoophoritis. To hide our ignorance on this point, it would be convenient if we had a rough word expressing the internal genital organs, to which to prefix the adverbs 'peri' and 'para.' But we have not such a word, and

I shall, therefore, in accordance with the old custom, give the uterus the precedence, and use terms compounded of it, as perimetritis, parametritis, &c., without always implying, by such use, a meaning exclusively and properly uterine, but implicating also the tubes and ovaries. I shall, indeed, use the words *perimetric inflammation* and *perimetritis*, *parametric inflammation* and *parametritis*, with a still wider meaning, implying inflammations, which directly owe their origin to disease or injury of the uterus, tubes or ovaries. For example, a lumbar abscess, or an iliac abscess, may be perimetric or parametric in origin, although lumbar or iliac in mere situation."

Pelvi-peritonitis, again, is the name to which a preference is given by Bernutz, and which is used by him in a sense precisely similar to that which Dr. Duncan has attached to his term "Perimetritis." There is very little in a mere name after all; but if we were to select the one which is least likely to lead to misapprehension, we would be inclined to select pelvi-peritonitis, as indicating a limited peritoneal inflammation, involving that portion of the membrane which invests the uterus, or other generative organs, and often causing adhesive matting together of various parts, and the formation of tumors, which may be discovered both from the brim of the pelvis, and from the vagina.

If we read, in most standard works, an account of what is usually called Pelvic Cellulitis, it would seem at first, as if the subject were exhausted, and placed on a basis which nothing could shake. All tumors, abscesses, and inflammations in the pelvic region were regarded in the light of this simple pathology, that an inflammation in the subperitoneal cellular tissue represented the proximate cause of the disease in almost every case. No one, however, who carefully observes such facts as may come practically under his observation, or who even takes the trouble to analyze the obstetrical and gynæcological records of the last few years, can fail to come to the conclusion that, so far from the subject being finally disposed of, it would be more correct to say that it is still in its infancy. And the more vigorously did he pursue his investigation, the more clear would it become that there lies here a field of study which is of deep interest, and of much promise.

From the results which have been disclosed by post-mortem examinations, it is certain that the uterine appendages are not unfrequently the seat of inflammation, varying in degree and in extent; the action, in some instances, being confined to the peritoneal coat, and in others extending more deeply, so as to involve the entire thickness of the Fallopian tube on the side affected. If the ovary is the seat of the disease, the result may, in like manner, be displayed, either on the surface of the organ, or,—should the action have reached more deeply, or have originated there,—the stroma may be found extensively disorganized, and occupied with abscesses varying in size. Such serious disorganization may at any time result from an extension of the destructive inflammation so characteristic of puerperal peritonitis; but, in the cases now under consideration, the symptoms are generally more chronic from the first, and are often looked upon, in reference to other coexisting phenomena, as merely secondary. It can be no easy matter, therefore, to determine where the disease has had its origin. The symptoms of inflammation of the uterine appendages are almost always very obscure. When the pain is circumscribed by limited peritoneal inflammation, its site in the iliac fossa, or lateral region of the hypogaster, may be held to indicate a probability that the structures in question are affected; but there are no reliable means for determining whether the morbid action is limited to the peritoneum and subjacent tissue, or extends more deeply so as to involve the deepseated structures of the tube, or ovary.

The diagnosis of these and the other allied affections depends, in a great measure, upon the results of abdominal palpation and vaginal examination; and, from the many fallacies which may spring in the course of such an investigation, it may be added, that upon the special experience of the examiner the accuracy of any opinion which may be formed will greatly depend. Dr. Matthews Duncan directs attention, at considerable length, and with much propriety, to the loose manner in which the expressions, "fulness," "hardness," and "tumor," are employed in the narratives which we read of such cases; and it is quite clear, although the words themselves are sufficiently explicit and significant, that much confusion arises from this source, especially, perhaps, in confounding tumor with mere hardness. The same remark applies to any investigation which may be made from the vagina; and it is, in every case, of the highest importance that we should determine if any connection exists between an enlargement observable from above and one which is made out from below. In the case of a solid tumor, free from serious adhesions, this is very readily recognized by such method of investigation,—the impulse communicated from one direction being readily transmitted to the other. If it be a cyst or abscess, fluctuation is thus sometimes distinguished, without any difficulty, between the two hands, which are simultaneously employed in the examination. But, in the case of mere diffused fulness, or hardness, or a tumor which is bound down by adhesions, the difficulty of diagnosis is increased, to an extent which is only fully recognized by those who have devoted most attention to such matters.

Pelvic cellulitis, peri-uterine phlegmon, or parametritis,—and accepting those expressions as synonymous,—indicates, as already stated, an inflammation of the subperitoneal cellular tissue, possibly radiating thence, and always involving a tendency to the formation of abscess. Until within a comparatively recent period, every mysterious tumor or enlargement following delivery, was, without much hesitation, referred to this category. Recent investigation seems, however, to assign to it a much less important position. To no one is modern science more indebted, in reference to this subject, than to M. Bernutz; but there can be little doubt that that experienced and able observer undertook to prove too much, when he thrust aside pelvic cellulitis,—merely admitting the possibility of its existence,—to make room for his own idea of pelvi-peritonitis. It is a dangerous thing to prove too much, inasmuch as anything approaching to exaggeration is apt to attach discredit, even to investigations which are otherwise of the highest importance. But, freed from this blemish, no impartial critic can deny that M. Bernutz has rendered to this particular department of science the most eminent service, in boldly exposing the fallacies which attach to the familiar idea of pelvic cellulitis.

"The slightest dissection," says the writer referred to, "shows that the cellular tissue subjacent to the peritoneum is so thin and scanty that it is impossible to separate the serous from the uterine tissue; and that, consequently, it cannot be the seat of swellings, which, according to M. Nonat's observations, attain, in the space of a few hours, to the size of a hen's egg. The only other possible position for the so-called ante- and retro-uterine phlegmons is the small band of cellular tissue situate at the junction of the neck with the body of the uterus, and this we can hardly credit, unless it be proved by an undoubted post-mortem examination, which has never yet been adduced. In the absence, then, of direct proof, I may be allowed to doubt the existence of this affection as described by M. Nonat. I have for four years asked for proof of this proposition; and, as no one has yet been able to give it, I shall assert that the swellings we are now considering, are certainly not formed by the inflammation of the thin ring of cellular tissue which encircles the upper portion of the neck of the uterus. In the exceptional cases, where this tissue is involved in the inflammation of the surrounding parts, it but very slightly augments the peri-uterine swelling, and this only when there exists also pelvi-peritonitis." It is not here denied, as will be observed, that inflammation of the subperitoneal cellular tissue occurs: it is merely pointed out that anatomical research strongly discredits the idea that inflammation is likely to be propagated directly from the uterus to the cellular tissue. It would appear that the only situation at which the cellular tissue subjacent to the peritoneum has any appreciable thickness, is where it joins the broad ligaments,—a situation at which all authorities admit of the probability of pelvic cellulitis; and even Bernutz himself confesses that phlegmons of the broad ligaments are justly so called; but he points out, at the same time, as an inference from various elaborate dissections, by MM. Jarjavay and Lefort, that the disposition of the various aponeurotic lamellæ almost necessarily directs such purulent formations as may ensue towards the abdominal walls, or else to the deep iliac fossa.

Aran and Bernutz make a broad but unfortunate distinction between iliac abscesses and those which are now under consideration. The history of an ordinary iliac abscess is no doubt very different; but, if we are to admit that the subperitoneal tissue and the internal genital organs are the site of inflammation, it is surely no great stretch of the imagination to believe that an abscess which is the result of this may make its way into the iliac fossa, so that, while originating within the true pelvis, the bulk of the resulting tumor is actually abdominal rather than pelvic.

What we owe chiefly to Bernutz, is the clear demonstration of the fact, that a large proportion of so-called cases of pelvic cellulitis are not so at all, but that the symptoms are due to circumscribed inflammation of the pelvic peritoneum. This pelvi-peritonitis is, as we have said, identical with the perimetritis of Matthews Duncan. "I conclude," says Bernutz, "that inflammation of the pelvic serous membrane is always symptomatic, and that it is generally symptomatic of inflammation of the ovaries or Fallopian tubes. Thus great interest attaches to the study of this affection; and it is very important thoroughly to understand the symptoms, in order to describe satisfactorily the uterine, and more especially the tubo-ovarian diseases which occasion it." By pelvi-peritonitis, then, we understand an affection which is essentially a secondary or symptomatic one,—the inflammation originating, according to Bernutz, in the uterus, tubes, or ovaries, and extending thence to their peritoneal investment. It is difficult to understand how the disease can spread in this manner without involving the intermediate cellular tissue, but the difficulty is very simply solved by Bernutz, by the denial that any such tissue exists over the uterus, except at the site already alluded to between the layers of the broad ligament. That this is the case we very much doubt, for, although it may be extremely thin, all analogy would lead us confidently to expect that a trace at least of cellular tissue must there be discoverable. That the peritoneal affection in these cases is secondary to inflammation of the subjacent organs is a fact which, in regard at least to the majority of cases, he has succeeded in establishing; but we do not think that he is warranted in assuming that pelvi-peritonitis can be produced in no other way. In some cases, the result has been the formation of cysts in the peritoneum, which are circumscribed by the inflammatory process, and may contain a purulent or muco-purulent fluid. In others, the tumor—the nature of which during life it had been impossible to determine—was discovered, on post-mortem examination, to consist of a mass of viscera matted together by adhesions, usually involving the tube and ovary with contiguous portions of the bowels. The diagnosis of this latter class of tumors is particularly difficult, as the structure of the mass is such as to render almost useless the valuable information which we obtain in other cases from fluctuation and percussion. Another point of importance, in reference to such cases, is the possibility of a mechanical obstruction to the function of that part of the bowel which is involved.

In a case seen recently with Dr. Moore, this appeared to us to be the cause of the severity and alarming nature of the symptoms. The patient had been confined about a month previously, and being out for her first drive, she imprudently got out of the carriage and sat for a short time on a bench in an exposed part of the park. On her return home she felt unwell. The following day acute pain was complained of in the left side above the groin, and the symptoms generally went on increasing in severity, while a tumor became developed in the region referred to. This tumor was irregular in shape and indistinct in outline, but, being exquisitely tender, it was difficult to make a satisfactory examination of it, further than that it was manifestly connected with a corresponding fulness which was easily recognized from the vagina. It was with the greatest difficulty that the action of the bowels was maintained; the tympanitic distension was enormous; and for some days the occurrence of obstinate vomiting prevented the administration of any remedies, or almost of any food by the mouth. Considerable benefit was derived from the use of suppositories containing tar, but it was on several occasions found necessary to give egress to the pent-up flatus by the use of O'Byrne's tube. Ultimately, after a long and anxious illness, this lady recovered, and the tumor disappeared.

We have here to do only with those cases of pelvi-peritonitis which are associated with the puerperal state, which constitute, indeed, nearly half of all cases from whatever cause arising. The disease, of course, originates, in almost all of this class of cases, in the uterus, and the affection is therefore one of metro-peritonitis; and this portion of the peritoneum is the more likely to be the seat of the lesion, the sooner the symptoms are developed after delivery. If at a longer interval, the chance of its being inflammation of the appendages is proportionally greater. The relation which the affection bears to puerperal fever is an interesting branch of the subject, upon which, however, it is impossible for us to enter; but we may infer that it is in the benign form only that we are likely to encounter cases of pelvi-peritonitis, as in the malignant form, from the violence and rapidity of the local disease, the pelvic portion of the peritoneum merely shares the morbid action with the rest of the membrane.

In attempting to form a diagnosis between pelvi-peritonitis and pelvic cellulitis, the following are among the more important points which it is proper to bear in mind. In the former, the affection is usually, though not invariably, limited to the true pelvis, and may be distinctly recognized from the vagina; in the latter, the true phlegmon, originating in the cellular tissue, cannot be reached from the vagina, but, tending to spread towards the iliac region, it can usually be made out by hypogastric palpation at an early stage of the case. The tendency to the formation of abscess and discharge of pus is greater in cellulitis than in peritonitis, so that the symptoms indicating the formation of pus may come to be of some importance in doubtful cases. If it be correct to assume that pelvic cellulitis, when it follows labor, generally originates in the broad ligaments, we can have no difficulty in understanding how tumors, originating in pelvi-peritonitis, and thus being intimately connected with the uterus, are not only more within the reach of the finger, but are frequently found to produce very marked displacement of the uterus in proportion to the size of the swelling. In the more chronic variety, the diagnosis of pelvi-peritonitis may involve doubts as to the nature of the tumor which is recognized from the vagina. The difficulty is supposed to be greatest in the case of the affection which has been termed "engorgement of the uterus," in which the tissue proper of the uterus is increased in volume; but the regularity, in these cases, in the outline of the tumor, its mobility, its firm consistency, and the transmission downwards of movements communicated to it from above, will probably serve to enable us to form a pretty confident opinion. Uterine displacements of various kinds and fibrous tumors may also be mistaken and erroneously supposed to be tumors, the result of pelvi-peritonitis.

The formation of an abscess is probably the result which, in puerperal cases, we look to with the greatest apprehension. It is only of late that it has been fully recognized that pus may accumulate in the form of abscess, not only in the cellular tissue but also within the peritoneum. This, indeed, forms a most important practical analogy between pelvi-peritonitis and the familiar pelvic cellulitis of most writers. The majority of all pelvic abscesses, occurring at the period of which we speak, are probably due to the latter affection; but some of our most able gynæcologists—Dr. Matthews Duncan, for example—hold a contrary opinion, and believe that intra-peritoneal purulent collections form the majority of grave abscesses in this situation. Supposing it to be admitted that the idea generally entertained as to the origination of pelvic cellulitis within the folds of the broad liagament is well founded, an interesting subject of investigation is thus suggested. Nor can we wonder that numerous dissections have been made, and experiments by injection or inflation of the cellular tissue performed, with the view of determining what direction an abscess in this particular situation is likely to take. The question is, however, far from solved, and we certainly find abscesses taking quite unexpected directions. "The most frequent extension of parametric abscesses," writes Matthews Duncan, "is either upwards, or into the iliac fossa on either side. But they may go much further. They may extend along the rectum to the perineum. They may extend to the kidney. They may, in assuming these directions, attack only cellular tissue, or, in addition, may lead to destruction of muscles, as of the psoas and iliacus. I have dissected such abscesses in the puerperal state, and in connection with non-puerperal disease, extending from the kidney to the uterus."

One of the most important practical points connected with these abscesses, whether they be parametric or perimetric, is the method to be employed for the detection of pus. Every clinical student is taught that fluctuation is the most reliable sign of the presence of fluid within a cavity which it fills, and is instructed how to apply the test, the manipulation being somewhat varied according as the accumulation is large as in ascites, or small as in an ordinary superficial abscess. In this strict sense, however, fluctuation is very rarely available in the diagnosis of pelvic abscess, for the obvious reason that while we require, to produce real fluctuation and at the same time to appreciate it, two hands, as a rule, in the investigation of these tumors, one hand, or it may be one finger, only is available. The circumstances under which actual fluctuation is then discoverable are to be found in those cases only in which the tumor has reached above the pelvic brim in the direction of the iliac fossa or elsewhere, or when it is possible to produce the wave of fluctuation between the fingers in the vagina and the other hand applied to the abdominal wall. The presence of fluid may, however, often be recognized quite easily by the finger in the vagina; but there are many cases in which to be certain requires a high degree of the *tactus eruditus*. "This is, however," as Dr. Duncan observes, "not feeling fluctuation. It is merely the educated finger picking up such sensations as enable the mind to perceive a collection of fluid in a cyst or bag. The finger cannot both produce fluctuation and feel the shock of the wave."

Treatment.—The management of pelvic cellulitis and pelvi-peritonitis depends, in the first place, and very obviously, upon the nature of the case. It will depend, moreover, upon whether the symptoms are acute or chronic; whether the disease is progressive or stationary;

and whether there is already evidence of the formation of an abscess. It is quite clear, therefore, that on many points the ordinary principles of surgical treatment must be our guide; but in so far as the treatment to be pursued is identical with what a moderate acquaintance with clinical surgery would indicate, we shall not follow the subject. There are, however, many special practical considerations, most of which experience alone can teach; but to one or two of these we may here briefly advert. Of the symptoms which call for prompt treatment none is of more importance than local pain. If the seat of the pain reaches above the brim, nothing is more grateful to the feelings of the patient than the application to that region of poultices and fomentations, which may be sprinkled with laudanum, or otherwise modified to suit the exigencies of the case. When the tumor is more truly pelvic, and can only be felt from the vagina, the vaginal douche sometimes gives temporary relief; and in other instances medicated pessaries, such as were recommended by Sir James Simpson, may be employed. Bernutz strongly advocated the internal use of conium, and it may even be necessary to use some of the preparations of opium.

The sufferings of the patient are sometimes greatly aggravated by the pressure which the tumor exercises on neighboring viscera, especially the bladder and the rectum, when the functions of these parts may be seriously interfered with. The exact nature of this class of symptoms will entirely depend upon the anatomical relations which the tumor bears to contiguous parts. When the pressure is forwards, in the direction of the pubic symphysis, the suffering which results from pressure upon the neck of the bladder is sometimes excruciating, and as one result of this may be constant calls to micturate, which is often effected with very great difficulty, the suffering which is thus produced may be intense. In some instances the bladder can only be emptied by the regular use of the catheter. When the pressure takes the other direction the suffering is not so severe, but there is almost always more or less of pain in the back. In some cases there is obvious mechanical interference with the function of the bowels, the difficulty in the act of defecation, and the flattened condition of the fæces, showing clearly the nature of the case. In some instances there is apt to be obstruction of a more serious nature, as in pelvi-peritonitis, involving the bowel, when the patient suffers much, both from obstruction and from flatulent distension. In every such case the action of the bowels should be scrupulously watched, and, on the slightest sign of obstruction, immediate means should be taken to prevent the possibility of serious results, by the combined action of laxatives and enemata. A simple injection of soap and water, with or without turpentine, may, in such cases, be given every night—a mode of practice which will, in many instances, contribute to the comfort of the patient.

The treatment, generally, of a case will divide itself into the arrest of inflammation, the promotion of absorption, and the discharge of pus when abscess has actually formed. It is with the view of fulfilling the first of these indications that bloodletting, in such cases, is usually recommended. Few persons will, probably, think of general bloodletting. It is, at least, difficult to conceive a case in which the circumstances would warrant such a measure. It is otherwise, however, as regards leeching, from which, in some instances, very marked and decided benefit may be anticipated. Leeches may be applied to the groins, the perineum, or the uterus; and although blood drawn from any of these situations may be productive of excellent results, it is obvious that the direct abstraction of blood from the uterus—more especially if that organ is involved, primarily or secondarily, in the morbid action—is the procedure from which we may anticipate the most marked effect. But if the nature of the case be such that it is impossible to introduce the speculum, the leeches may be applied to the vulva, taking care that they do not bite too high; for it has happened that very troublesome bleeding has been the result of the application of leeches to the vagina, from the difficulty of reaching and controlling the bleeding point. "I believe," says Bernutz, "that four leeches applied to the cervix are as good as three times that number applied externally; for not only is it nearest to the seat of inflammation, but the relief to all the genital organs is greater. I do not think even scarification can be compared with leeches, in point of utility; the amount of blood drawn off is, comparatively speaking, quite insignificant; and there is the possibility of serious consequences resulting."

It is never necessary to apply more than three leeches at a time to the os and cervix, for if the quantity of blood which is withdrawn should not be deemed sufficient, the flow may be encouraged by a warm hip-bath, by means of which the quantity may often be regulated at will. As a rule, it is not advisable to aim at the abstraction of a large quantity of blood, as a very moderate discharge is all that is necessary thoroughly to deplete an organ of the size of the womb; but besides this there is the danger of interfering with the menstrual function, should we push depletion too far—more especially if the period be at hand. In the actual application of the leeches, some nicety of manipulation is sometimes required to prevent them from crawling round the edge of the speculum, when they will probably fix upon the vagina, or even pass out by the vulva; and, as it has happened that disagreeable symptoms have resulted from the leech making its way into the uterus, it is recommended in pluriparæ, or in any case where the aperture is large, to put a small plug of wool in the gaping os. It is to the acute stage, mainly, of the cases of pelvi-peritonitis, in which the uterus, or its appendages, are assumed to be the original seat of the disorder, that leeching is applicable; but there are, undoubtedly, cases of cellulitis in which congestion of the womb exists as a complication, where the treatment is precisely similar. And at any stage of the more chronic forms, an exacerbation of the symptoms may present such features as clearly to call for local depletion. In the present state of our knowledge it will not do to pause in these cases until our diagnosis is complete. The indications which point to bloodletting as the proper remedy at the time being clear, it is a very secondary matter to determine whether the peritoneum or the cellular tissue is the part involved.

Poultices, fomentations, hip-baths, and the vaginal douche, are extremely valuable agents in these as in other affections, in controlling inflammatory action, and, as has already been observed, in alleviating pain. But the fact is, that there is no stage of the disease at which this class of remedies may not be found beneficial. They should be employed continuously in the acute stage; and in the case of an abscess which threatens to point externally, the application of poultices may also be diligently carried out. In cases where the result of the inflammatory action has been the formation of a tumor, or more diffused hardness, it comes to be a question whether nothing can be done with the view of promoting absorption. At one time, when the professional belief in mercury was unbounded, that drug would naturally have suggested itself as an essential part of the treatment, either in the acute stage, in that of which we are now speaking, or in both. It must be confessed, however, that comparatively little faith is now placed in mercury as a remedial agent. Many reject it absolutely, in this and other diseases; but in so passing from the abuse to the absolute neglect of the drug, we think that the modern physician, as in the case of general bloodletting, has gone too far. We should certainly recommend that the patient should, at least, have the chance which such a remedy affords her; but, if there be anything to contraindicate the use of mercury, it may be abandoned with less regret than if we had more faith in its action. The most suitable preparation is the perchloride, which may be administered in doses of $\frac{1}{18}$ of a grain, and should never be carried beyond the stage at which the gums, &c., indicate, faintly, commencing mercurialization.

Iodine is another remedy of the same class, which many will employ with less hesitation, either in the form of iodide of potassium internally, or, it may be, by the external application of the tincture or ointment. The latter may be applied when the tumor is hard and chronic, and can easily be recognized through the abdominal walls; or they may be employed in similar circumstances through the vagina, a method of treatment which has been found beneficial in many of the uterine disorders familiar to the gynæcologist. Blistering has been strongly advocated by some after the acute stage is past, and no one will deny that experience would encourage us to look to this mode of treatment for satisfactory results; but we confess to a preference for the external application of iodine, by which irritation may be maintained for a long period, its action being, of course, kept within moderate bounds so as not to irritate too much.

In cases in which pelvic abscess has formed, and the ordinary signs revealed that pus is present in considerable quantity, it comes to be an important practical point whether we are to operate by incision or leave the case absolutely to nature. In so far as can be gathered from the experience of modern practice, abscesses, wherever existing, are now much less frequently opened than was the ordinary practice of a quarter of a century ago. But, whatever be the case as regards ordinary surgical practice, it is certain that, in the management of pelvic abscesses, particular care and discrimination is necessary. Caution is more imperatively demanded when the tumors show a tendency to point in the groin or elsewhere above the pelvis; but it must at the same time be remembered that, while the danger of premature operation is admitted, the greater danger of rupture of the sac and escape of its contents into the peritoneal cavity must not be overlooked. Some have said that such an abscess should be opened *when it threatens to burst into the peritoneum;* but in what this threatening consists, or how we are to recognize the danger, is what no one has attempted to show. If the abscess is acute in its history and progress, it is better to leave the operation to nature; but, if it is mature and chronic, and shows no tendency to point externally, it comes to be a very delicate matter to determine whether we shall operate or not. If we dread its opening into the peritoneum, we must at the same time bear in mind what the experience of West, Bernutz, Aran, and others has clearly shown,—that, even if we open an abscess, this does not prevent its subsequent perforation into the peritoneal cavity. If the symptoms of hectic fever manifest themselves, or if the tumor gives rise to great suffering, the idea of operation will naturally receive encouragement; but, in the absence of these conditions, it is always better to wait. Pelvic abscesses may point at various situations externally, which are well known to the surgeon, or they may only be reached through the vagina, or even by the rectum; but, in any case, when the operation is resolved upon, the opening should be free, so as to admit of a thorough evacuation of the cyst. "Old pelvic abscesses," Dr. Duncan observes, "demand even boldness in operating. . . . I have repeatedly operated in cases where I knew the abscesses were several years old; and in such cases sometimes more than once; and I have never had reason to doubt the propriety of the treatment."

There is another class of pelvic tumors, the nature of which was recognized by Ruysch in 1691, but which has received very little attention except at the hands of quite modern gynæcologists. These are the sanguineous tumors—the result not unfrequently of menstrual accumulation outside of the uterus—to which the name of Peri-uterine Hæmatocele has been given. This question is too complicated to enter upon here, and, indeed, there is only one section of it—the intra-pelvic hemorrhage occurring in extra-uterine pregnancies—which comes strictly within the scope of our subject. These tumors are merely mentioned at this place, as they might possibly give rise to difficulties in the diagnosis of the affection which we have just been considering.

Twenty years ago, no one could presume to write a treatise on Midwifery without an elaborate disquisition on the subject of Anæsthesia. The then recent discovery of chloroform and of the anæsthetic power of sulphuric ether was an era in the history of surgery; and we cannot wonder that the obstetrician should have claimed for his art the immunity from pain and the other advantages of which his surgical brethren were so gratefully availing themselves. We look back to this period (*circa* 1848), and turn over the pages of the pamphlets which mark the bitterness of the controversy which was then being waged, with a feeling partly of amusement and partly of humiliation. The theological tone which was prevalent in some quarters is the most extraordinary feature in the whole affair; but how sensible and able men could write such trash, and argue gravely against the iniquity which was being perpetrated in relieving women from the effects of the divine curse "*in dolore paries,*" will ever remain an inscrutable psychological phenomenon.

There are many agents which have been classed as anæsthetics, and there no doubt are many more. At present, ether and chloroform are the only two which are habitually employed; and to these we may perhaps add chloral, as it is now pretty well known that a patient, thoroughly under the influence of this drug, may go through the whole stages of labor without any sensation of pain or any consciousness of the process which is going on. Ether and chloroform, however, the one in America and the other in this country, are from the evanescent nature of their effects, preferred to those agents whose operation is more permanent, and after which disagreeable results are more likely to accrue. At first, partly from the impulse and surpassing interest given to the subject by its eminent discoverer, chloroform was used somewhat indiscriminately in cases of labor which were in all respects normal; but subsequent experience has shown that such wholesale use of anæsthetic agents cannot be supported, either by argument or by practical experience.

The result of numerous experiments has proved that chloroform, which is sparingly soluble in the blood, travels through the circulation in considerable quantity, in an uncombined state. It having a strong affinity for oxygen, the ordinary chemical changes which normally take place in the blood, are thereby materially interfered with, and Dr. Snow has shown that, in consequence of this, the quantity of carbonic acid evolved from the lungs is materially diminished. Such an effect, if of short duration, will probably produce no very serious result upon the economy; but should the action be unduly protracted—which is necessary, if we wish absolutely to annihilate pain in labor—we can well imagine that the ultimate results may be in some way or other unsatisfactory. It has frequently been observed, and many have noted it as a remarkable fact, that the effect of chloroform does not seem in any way to arrest or even to modify the expulsive efforts; but, if we bear in mind what has been said in regard to the reflex action produced by an excess of carbonic acid in the blood, the experiments of Dr. Snow afford a ready explanation of this, which was at one time supposed to be a phenomenon, unique in itself, and of great interest.

The effect of chloroform on the nervous system is, however, the point in regard to which in the practice of midwifery, the greatest amount of interest attaches. In the view which we take of the subject, by far the most important point is that a moderate dose of chloroform may annul, or at least deaden sensation, without disturbing the power of motion or consciousness. This enables us to alleviate the sufferings of our patient by a trifling dose, and without bringing her fully under the influence of this powerful agent. The interference, therefore, with the chemical changes which are constantly going on in the blood is proportionally diminished. The further we push the administration of chloroform, or of the other anæsthetics, the more thoroughly is the cerebro-spinal or reflex function influenced, until at last the motor fibres of the respiratory nerves are affected, and stertor indicates that *Ultima Thule* of safety has been reached.

The disadvantages of chloroform in the practice of obstetrics are, in the first place, the tendency to vomiting, which is so apt to be produced in the course of its administration. For obvious reasons, however, the stomach rarely contains much food at the period of delivery, and this is no doubt the reason why vomiting is, in midwifery, when chloroform is used, comparatively rare. Still, it does occur; and, more than that, it occasionally persists for a considerable time, to the manifest disturbance of the patient during the post-partum period. Partly on this account, and partly, it may be, in consequence of the effect which is produced on the nervous centres, it has been pretty clearly established that the indiscriminate use of chloroform, or other anæsthetics, predisposes to hemorrhage after delivery. Another objection which has been stated is perhaps of less importance,—that in operations, the annihilation of sensation removes what was before a reliable safeguard, as, for example, when the blades of the forceps are applied, the patient is no longer conscious of the pain caused by including a portion of the vaginal mucous membrane in the lock—the suffering produced by which would previously have caused her to cry out.

The question of anæsthetics seems to us to stand thus. In eclampsia, in some cases of mania, and in all cases of operative midwifery, it is, without exaggeration, invaluable. In ordinary cases, it is always to be used with caution, but if employed in small quantities on a handkerchief on the approach of each pain, towards the termination of the second stage, it can never do harm. It thus allays pain and assuages nervous irritability; and, in the hand of the skilful practitioner, it is a power for good and never for evil.

APPENDIX.

THE BIPARIETAL OBLIQUITY OF NAEGELE.

For reasons which have already been stated, but chiefly with the view of avoiding controversial matters in the text, I have thought it better to express, in the form of an appendix, the reasons which have led me to reject the theory of biparietal obliquity as an element in the mechanism of parturition. The following observations, with some modifications, are mainly taken from my work on the "Mechanism of Parturition," published in 1864. The error of Naegele is certainly not so commonly taught as it once was, and many distinguished teachers and writers have completely abandoned it; but the fact of its still being a matter of common belief, together with the respect which is due to any doctrine having the stamp of the authority of the distinguished Professor of Heidelberg, makes it both necessary and fitting to analyze the subject with some care. But, as some doubt has occasionally arisen in regard to the exact nature of Naegele's views, it will be proper first to make sure what his opinions were before proceeding to refute them.

In his celebrated essay, originally published in *Meckel's Archiv*, Naegele describes, in addition to the pelvic and occipito-frontal obliquities, a third obliquity, the *biparietal*. He maintained, therefore, that, in regard to its transverse measurement, the head entered the brim obliquely, "so that the greatest breadth of the skull (from one *tuber parietale* to the other), as also the breadth of its base, never in its passage, under ordinary circumstances, coincides with the diameter of the brim." On this point he says also, in describing the first position:

> "The head has not at the brim a direct but a perfectly oblique position, so that the point which lies lowest or deepest is neither the vertex nor the sagittal suture, but the right parietal bone. The sagittal suture is nearer to the promontory of the sacrum than to the pubis, and divides the *os uteri*, which is directed backwards, and generally somewhat to the left, into two very unequal parts. . . . . The higher the head is, the more does its long diameter approach the transverse of the brim, and the more oblique is its position, on account of which the right ear can generally be felt without difficulty behind the pubis, which would not be the case if the head had a perpendicular direction."

These extracts leave no room for doubt that his meaning was really a lateral flexion of the head, an approximation of the ear to the corresponding shoulder. He also describes, but in terms which, being somewhat vague, have led to some misapprehension, that there is a biparietal obliquity at the outlet; but in this he is, as has been observed in the chapter on the "Mechanism of Parturition," quite correct. The following observations, it is proper here to explain, have reference to the first cranial position.

Biparietal obliquity.—It will be understood that, in considering the second kind of obliquity—that, to wit, by means of which the head being rotated on its occipito-frontal axis brings the left ear, in the position which we are considering, towards the left shoulder—I must, in pursuance of my plan, view the head in reference to the axis of the brim alone. The presenting point of the cranium I shall consider throughout, until the head reaches the floor of the cavity, as that through which the axis of the brim passes, its situation being altered only by a variation in the different kinds of obliquity.

Most modern writers, including the many eminent obstetricians of our time, agree in adopting Naegele's view with reference to this obliquity. It is therefore with much diffidence and hesitation that I here submit a contrary opinion, although I have only convinced myself of its truth after a careful and laborious study of the progress of labor. I am persuaded that, in a pelvis of ordinary dimensions, the usual course of labor is for the head to enter directly in the axis of the brim, with the sagittal suture equidistant from pubis and sacrum. The accompanying illustrations show this more plainly, and in both the observer will remember that he is looking *upwards and forwards,* the axis of vision corresponding to that of the brim. The direct position, as here shown, is in most respects the same as that which was taught by the leading obstetricians who immediately preceded Naegele. He, however, discovered and first announced the incontrovertible fact which is set forth in the following words :

FIG. 180.

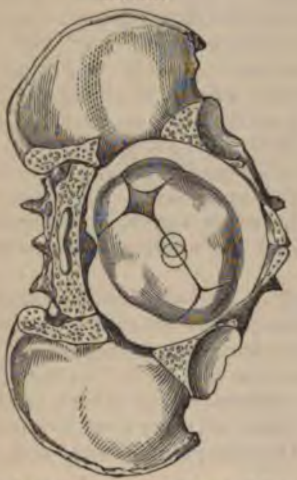
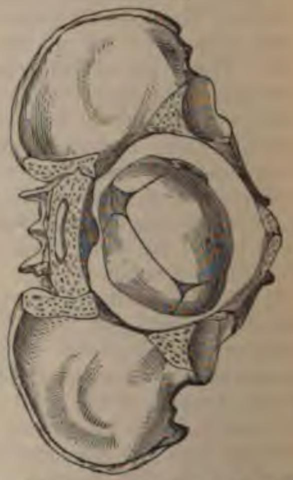


FIG. 181.



In Figs. 180 and 181, the floor of the pelvis has been removed by a section, including the greater part of the walls of the cavity. In Fig. 180, the head is represented as descending directly in the axis of the brim. The dotted circle shows the effect on the apparent position of the os uteri of a slight displacement to the side. In Fig. 181, the head is represented as descending in the position described by Naegele.

> "The finger which is introduced in the central or middle line *of the pelvic cavity,* and brought in contact with the head, will touch the right parietal bone in the vicinity of the tuber. . . . . . . At the brim, the head does not assume a perpen-

> dicular, but a perfectly oblique position (*keine gerade, sondern eine ganz schiefe Stellung*), so that the part which is situated lowest or deepest is neither the vertex nor the sagittal suture, but the right parietal bone."

I repeat that the fact thus stated in general terms is incontestable, inasmuch as it obviously refers to the axis of the cavity; but Naegele goes beyond this, and pushes his conclusions much further than the facts of the case warrant, when he says that the sagittal suture is nearer the promontory of the sacrum than the symphysis pubis, and that the biparietal measurement can *never* during labor coincide with the plane of the pelvic entrance. I may mention here that, although I began my study of the subject with a firm conviction that Naegele was right in this particular, I have been step by step driven to the conclusion that he is perfectly wrong. It is perhaps unnecessary to say that the view which I take of the position of the head at the brim is, albeit somewhat heterodox, far from original. Nor is the doctrine without powerful supporters, as this is the view entertained and clearly expressed by Velpeau and Cazeaux in France, and more recently in this country by Dr. Matthews Duncan; and several other observers, among whom I may mention Drs. West and Paterson,[1] have arrived independently at the same conclusion, which they have expressed in a more cursory but not less decided manner. M. Cazeaux expresses it as follows:

> "Avant la rupture de la poche des eaux, la tête du fœtus est légèrement fléchie sur le devant de la poitrine, et les rapports des diamètres de la tête avec les diamètres du détroit supérieur sont les suivants; le diamètre occipito-frontal est parallèle au diamètre oblique gauche du détroit supérieur; le diamètre bipariétal est parallèle au diamètre oblique droit; la circonférence occipito-frontal de la tête est parallèle au pourtour du détroit supérieur; l'axe de ce détroit supérieur passe par le diamètre trachélo-bregmatique."

The arguments of Naegele on this point are stated, as indeed all his views are, with great clearness and precision, and are, I admit, apparently conclusive and convincing. But I do not despair of being able to show that he has been led into error, if my readers will only deign to put aside for a time a preconceived opinion and study the subject in nature. I may fail in any argumentative attempt to show that Naegele was wrong, or I may be met with reasoning more subtle than my own; but I would only ask that, as my arguments are founded upon practical research, those who would refute them should test the matter fairly—a task which will involve some labor, but which is within the power of every practitioner in midwifery.

In admitting the general accuracy of most of Naegele's descriptions, I assume that the fundamental error from which, more than any other, his mistake arose, was ignorance, at the time he wrote his essay, on the subject of the great obliquity of the brim in respect to the horizon. There must, I think, have been remaining in his mind some remnant of the old idea of the *horizontal* brim; for it must be remembered that his attention was not directed to the subject of the relation which the pelvis bears to the trunk and limbs, until some years after the date of the publication of his paper on the mechanism of parturition. If the brim were indeed parallel to the horizon, or nearly so, the fact of the finger meeting the parietal bone in the vicinity of its tuber would be clear and irrefragable evidence of the so-called lateral or biparietal obliquity of the head. But if we do not allow ourselves to lose sight of the fact that the brim is inclined at an angle of 60°, and that the vertex or presenting part passes downwards and backwards so obliquely as to meet the horizon at an angle of 30°—even admitting that the right parietal bone in the vicinity of its tuber is the lowest part in the pelvis—I cannot see how this is to be accepted as evidence of anything else than that the head is advancing directly in the axis of the brim, but very obliquely with regard to the cavity, and still more so with reference to the horizon, as is shown in Fig. 182.

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[1] Glasgow Medical Journal, October, 1862.

If to this great and admitted obliquity we superadd that which, according to Naegele, separates the sagittal suture from the axis of the brim, so as to bring the middle part of the suture opposite the fourth division of the sacrum, "whether," says the younger Naegele, "the head stands deeper or shallower," we must first believe that the trachelo-bregmatic measurement is as nearly as possible parallel to the horizon.

Fig. 182.

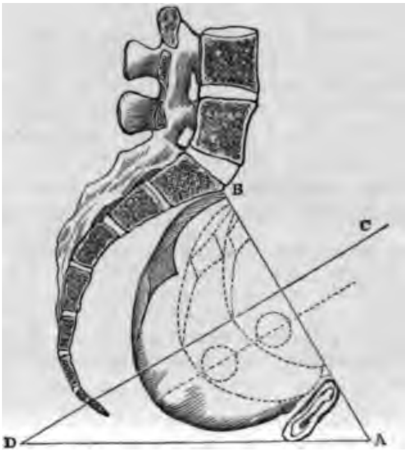

Fig. 182 shows the great amount of lateral obliquity (*quâ* the horizon) of the head advancing in the axis of the brim, the centre of the sagittal suture being, although much nearer *the sacrum*, exactly midway between the promontory of that bone and the symphysis pubis. It shows also how, during the whole of this stage of labor, the right tuber parietale may be described, in general terms, as the part which first meets the finger, or as lowest in the pelvis, advancing as it does in the direction of the dotted line parallel to the axis of the brim. If the head were in the transverse position, the sinking of the tuber parietale would be still more decided, but in that case it would be slightly to the left of the middle line.

A B. The plane of the brim meeting the horizon at an angle of 60° at A.

C D. The axis of the brim passing through the centre of the sagittal suture and the coccyx, and meeting the horizon at D at an angle of 30°.

The first difficulty which shook my conviction in the accuracy of Naegele's statement was here encountered. Granting for the moment that his description is correct, let any one take a fœtal skull and place it in the dried pelvis in such a position that the vertex is approaching its floor, with the sagittal suture directed as above described, when he will find—and there is, I think, no avoiding this conclusion—that the ear could in all circumstances be felt with the greatest ease; and yet we all know that it is almost always a matter of considerable difficulty to reach the ear at this stage, even more so indeed than when the head is situated higher. This difficulty has not by any means been overlooked by Naegele; but having adopted one fundamental error, he makes this the standard by which he gauges deviations from his theory, and thus is inevitably led further astray. He explains it thus: "The higher the head is, the more oblique is its direction, for which reason the ear can generally be felt behind the pubis without difficulty, *which would not be the case if the head had a straight direction.*"

I admit that on the first blush this argument has a significance, which it does not, however, maintain on closer examination. In the first place, he commits himself to the opinion that this alleged obliquity has no reference to the resistance which the head experiences from the pelvis, inasmuch as it is greater before this resistance can have come into play. He then goes on to assume that the fact of the ear being felt behind the pubis at an early stage of labor, is a proof of this obliquity. With reference to this point, I would remark that he seems to me, throughout his whole essay, to put too much weight on the facility with which the ear may be felt at the beginning of labor. That it may in many cases be so felt is an undoubted fact; but as far as my experience goes, I have in the great majority of cases found it no such easy matter to reach the ear, in any stage of labor, as Naegele would have us believe. When I can so reach it, it only proves to me, what Naegele himself admits, that the head approaches the transverse diameter more than usual. For it must be remembered that the upper part of the pubic symphysis is within easy reach of the outlet, and that, on account of the inclination of the brim, when the ear moves to the side it moves at the same time *upwards* along the ilio-pectineal line, and consequently further from the finger. This then is a mere assertion of Naegele's; his proofs are in no degree incompatible with the idea of a direct entrance of the head. I am quite willing to admit that in some extreme cases in which the ear is felt with unusual ease, as well as on other rare occasions, there may be some exceptional obliquity; but I am perfectly convinced that this is the exception, and the direct entrance the general rule. But there are other arguments familiar to every obstetrician which must be met, and if possible, refuted.

"The sagittal suture," says Naegele, "divides the os uteri, *which projects backwards and generally somewhat to the left*, across into two very unequal segments." Mark how ingeniously he argues from a preconceived opinion, and trims his facts to suit his theory. We may allow the alleged inequality of the segments in the meantime to pass; but as this is quite insufficient to account for the amount of obliquity which he describes, he maintains that the os is displaced in the very directions which suit his argument, viz., backwards and to the left. For it will be observed, on a reference to Fig. 180, that the effect of a slight displacement to the left is, in the direct position at the brim, to throw the small segment forwards, and it will be understood at a glance that the further effect of a displacement backwards would be to leave the sagittal suture concealed by the anterior lip of the os; whereas, by bending the head towards the left shoulder, his theory restores the relative positions of os and suture. This is the flimsiest of all his arguments, inasmuch as it is purely theoretical, and depends entirely for its accuracy on the correctness of his original statement in regard to the obliquity. The difficulties in determining the relations of the os during labor are very great; but taking, as I do, the fact of the sagittal suture crossing the os at the beginning of labor as evidence of the direct entrance of the head, I see no reason to doubt that the centre of the os corresponds pretty nearly to the axis of the brim. I even doubt the general accuracy of the assertion that the smaller segment is behind, and I have certainly, at an early stage of labor, found it to vary considerably in this respect. Dr. Paterson, who, although admitting this fact, is nevertheless convinced that the head enters the brim directly, attempts to account for it by supposing that the os is displaced forwards; but I rather think that he has no more proof to offer of this statement than Naegele had of his, or than I might have if I chose to assert that the os was always displaced to the right merely because this would suit my purpose.

The statement which accompanies the above, to the effect that the sagittal suture is much nearer to the promontory of the sacrum than to the pubis, is equally erroneous. But, with reference to this, a certain misapprehension is apt to occur, if we use, instead of the words of Naegele, the expression, "nearer the sacrum," which some modern writers employ. For, as a natural consequence of the head advancing in the axis of the brim, the suture is beyond all doubt nearer *the sacrum;* but it is as certainly no nearer *to the promontory of the sacrum.* I think there is no one who has a correct idea of the relation which the pelvis bears to the vertebral column, and who will introduce his whole hand with a view to determine the position of the head at the brim, who can fail to arrive at the same conclusion as that which I have attained. For my part, I have left no means untried by which this might be tested. On introducing an instrument which is well known to surgeons as Professor Buchanan's rectangular staff for lithotomy, I have been able to place the angle on the second bone of the coccyx, inclining the short limb until it coincided, as nearly as I could guess, with the axis of the brim, when it never failed to guide me, if properly placed, to the sagittal suture, or some point very near it, on either side. I have even attempted a crucial experiment by measuring, by means of a flexible scale, the distance from the sagittal suture to the promontory of the sacrum on the one hand, and the pubis on the other; and although, for obvious reasons, the results were not so accurate as to warrant of themselves any definite conclusion, they certainly tended to confirm my belief.

But the greatest difficulty of all, and the fact which, more than anything else, seems to confirm Naegele's theory, is the situation in which the tumor called the *caput succedaneum* forms, in those cases in which the waters have escaped, and the head is exposed at an early period of labor to the pressure of a rigid and undilatable os. On this point I have to acknowledge my obligation to Dr. Matthews Duncan, whose researches on the evidence afforded by the situation of the swelling, as described by Naegele, solved my only remaining doubt on the subject. Every accoucheur has had frequent opportunities of confirming the accuracy of the following statement of Naegele's, and which apparently affords striking corroborative proof of the accuracy of his assertions:

> "In certain circumstances, a swelling of the cranial integuments forms after the os has begun to dilate, which in the further progress of labor, when the os changes its situation and direction, and the head its position against it, disappears again by degrees; nevertheless, as dilatation proceeds, it may still be felt for some time, although much softer. This swelling (in that position of the head which we are talking of) is situated upon the *right* parietal bone, close to its upper edge, and equidistant from both angles. Sometimes a small piece extends over the suture to the left parietal bone; its circumference depends upon the degree of dilatation which the os uteri has attained."

Now this situation of the swelling may indicate one of three things: The os may either be inclined forwards; or it may be subjected to greater pressure at certain points of its circumference; or, again, the head may be placed obliquely. Of these, with the proof which I elsewhere have of the direct entrance of the head, I consider the last as the most improbable of the three. It must always be remembered that, to account for the degree of obliquity described by Naegele, we must adopt in addition his theory that the os is displaced backwards and to the left; but nevertheless we must endeavor to account for the fact that the bulk of the swelling at least is to be found at the right parietal bone. I have already alluded to the theory advanced by Dr. Paterson, that the os is inclined forwards, which would, if correct, afford a most satisfactory explanation of the phenomena as detailed above. Proof of its accuracy is, however, wanting, and indeed the difficulties which an examination offers are such that we cannot hope for a strict demonstration of the fact, even if true, unless we were to argue from the assumed fact that the entrance of the head was direct, and thus adopt the very error in reasoning which has led Naegele astray.

The theory by which Dr. Matthews Duncan attempts to account for this, demands a separate consideration. This able writer is of opinion, that it is a mistake to suppose that the thickest or most prominent part of the swelling corresponds to the centre of the area upon which it has been formed, but that this is to be found in the direction in which the least resistance is offered to its formation. Applying this argument to the formation of the swelling in this stage, he says:

> "The caput succedaneum of the first stage of labor is often formed after the head has passed the brim of the pelvis, and is lodged in the upper half of the cavity of the bony pelvis. Were we to be cautious and exact in reasoning, all such swellings should be excluded from the argument, for evident reasons. It is only those formed at the plane of the brim, or very near it, that can, under any circumstances, afford assistance in settling this question: under the actual deficiencies of exact data, we must be content with stating principles. Now, it is evident that the direction of the caput succedaneum of the first stage will be that of least resistance—that is, the direction of the axis of the undilated vagina; in other words, the caput will be thickest when the head is least supported, and may, in other parts within the centre of the os uteri, be so inconsiderable as not to attract notice. Further, and for the same reason, the centre of the caput succedaneum, or the centre of the os uteri, will not correspond with the thickest portion of the swelling, but in this case be behind it, or near the left parietal bone. The oblique direction downwards and forwards of the vagina will lead the caput in that direction, and the support given by the posterior wall of the vagina to the posterior half of the space inclosed in the circle of the os uteri will cause thickness of the swelling over the right, and comparative thinness over the left parietal bone, and displacement of the thickest portion of it forward in the pelvis, that is, in the direction of the right parietal and away from the left parietal bone."

This theory is extremely ingenious, and affords to me the only explanation of the facts described by Naegele, which gives a rational and satisfactory solution of the problem, in conformity with the phenomena which I myself have observed. For its absolute accuracy I cannot vouch; but I cannot help thinking that it is in the main correct, or at least that it points out the direction in which we are to search for truth.

My last argument is one which, while of itself it goes for nothing, is at least admissible as corroborative proof, and is drawn from a consideration of the *cui bono?* No such argument would for a moment stand against a single observed fact, and we have too many instances of this in the history of the subject to permit us to tread otherwise than warily on such dangerous ground. But after all we may surely ask, what is the use of this alleged obliquity? It is not only said to take place before the head is actually engaged in the brim, but, according to Naegele, is more marked then, and cannot therefore be due to any resistance from the hard parts of the pelvis. But, even if it did not occur till the head experience the resistance of the brim itself, it is difficult to conceive what mechanical advantage would result therefrom, as there is ample room and to spare in any well-formed pelvis for the biparietal measurement of a full-sized fœtal cranium. In the case of the long diameter of the head, we are able, without any difficulty, to assign a cause for the obliquity which causes the occiput to pass in advance of the forehead, but in this case I cannot imagine a single theory which will bear examination for a moment. I can understand how it may exceptionally occur, being rendered necessary by a deformed pelvis, a distended rectum, or some other cause, but I am perfectly convinced that the rule in the vast majority of cases is, that the head enters the pelvis *directly*, in—or nearly in—the axis of the pelvic brim.

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